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ABSTRACT

This guide attempts to show educators and parents how elementary school industrial arts (ESIA) activities in the classroom can increase a child's competencies in basic skills, computer applications, and other class assignments, while also expanding the child's knowledge of careers and the rapidly changing world of work. The guide provides administrators, elementary school principals, classroom teachers, and industrial arts consultants with several strategies for integrating industrial arts activities into the curriculum. The guide contains 13 sections that cover the following topics: a rationale for elementary school industrial arts, research on the effectiveness of ESIA, how ESIA can enhance career education, learning environments for doing ESIA, ESIA activities by grade levels, preparing instructors for teaching ESIA, funding, tools and materials, safety considerations, local resources, public relations, sample lesson plans, and evaluating ESIA. Various learning activities and teaching strategies are included in each section, as appropriate. (KC)

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ED234272

Elementary School Industrial Arts

An Educator's Handbook Containing Approaches and Resources for Making the Elementary Education Curriculum More Effective Through Industrial Arts Activities

Contract #04-2002

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TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

Foreword

Many educators define industrial arts as a subject taught in school to develop students' manual skills and familiarity with tools and machines. Parents may define industrial arts as "too much play" and non-essential to the teaching of fundamentals. This guide was written to help dispel those limited definitions. It attempts to show educators and non-educators how industrial arts activities in the elementary classroom can increase a child's competencies in basic skills, computer applications, and other class assignments, while also expanding a child's knowledge of careers and the rapidly changing world of work.

When young children work with tools, machines and computers, they develop not only manual and physical skills, but an increased interest in the traditional elementary curriculum. Reading, writing, speaking, mathematics, computer applications, science and social studies are skills used in elementary school industrial arts activities. Teachers who become involved in an elementary school industrial arts program often comment that children begin to display significant positive attitudes toward other class assignments. In other words, industrial arts activities in elementary school classrooms can make a school program "come alive" with meaning and purpose.

It is important to realize that this guide is not total in content or absolute in nature. Rather, it provides administrators, elementary school principals and classroom teachers, and industrial arts consultants several strategies for integrating industrial arts activities in the curriculum. It can be used independently by the user or in a classroom setting for pre-service education. In addition to the many resources cited in this guide to assist educators in developing an elementary school industrial arts program, the teachers and consultants who compiled this guide are willing to assist and talk to educators.

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Contents

A Rationale for Elementary School Industrial Arts 4
ESIA and Civil Rights 10
Reinforcing Quality Education 16
Decisions at the Local Level 20

Relevant Research: Does ESIA Really Work? 26

The World of Work: Can ESIA Enhance Career Education? 36
Career Education, Grades K-6 40
Program Objectives 44
Dictionary of Occupational Titles 48
Occupational Outlook Handbook 51
Audiovisual Aids 52
Teaching Strategies 54

Learning Environments: Where Can We Do ESIA Activities? . . . 72
Self-Contained Classroom 74
Separate Laboratory Facility 78
Mobile Laboratory 80

ESIA Activities by Grade Levels: What Can Students Accomplish? 84
Developmental Characteristics 85
Early Childhood Guidelines 90
Suggested Industrial Arts Activities 96

Teacher Development: Professional Assistance for the Teacher . . 106
Preparing Industrial Arts and Classroom Teachers 108
Role of the Industrial Arts Teacher 112

Funding: How Do We Pay for ESIA? 120
Competitive Funding 123

Tools and Materials: What Do We Need to Get Started? 128
The Use of Kits 138
Storing the Equipment 140

Safety Considerations: Making ESIA a Safe Experience 144
Basic Considerations 145
Sample Accident Report 156
Act 116, Eye Protective Devices 158

Resources: What Kind of Local Assistance is Available? 162

Public Relations: Gaining Support for an ESIA Program 170

Sample Lesson Plan 176

ESIA Evaluation: How Well Did We Do? 190
Evaluation Techniques 192

A Rationale for Elementary School Industrial Arts

"Industrial arts activities will not answer all the needs of elementary education, but neither can all these needs be met without industrial arts. Industrial arts activities are necessary in a complete program."

- Carl Gerbracht and Robert Babcock
Elementary School Industrial Arts (1969)

Education in twentieth century America has witnessed many new policies and new practices in order to keep abreast with the changing values and lifestyles of Americans. The search for how to adequately prepare children for adulthood is even more complicated today because of increasing demands for better services, and decreasing financial resources. When accountability and dwindling resources are a daily reality, the identification and use of more effective teaching techniques are major concerns. One option for meeting these demands and needs is a program of elementary school industrial arts.[1]

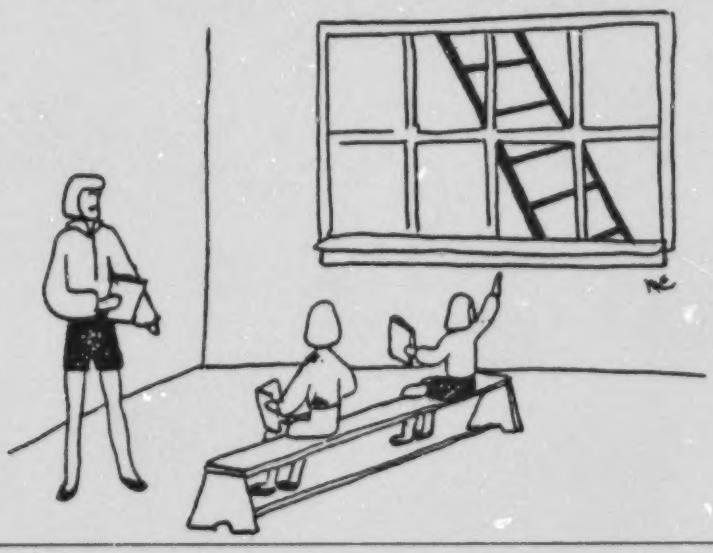
A program of elementary school industrial arts (ESIA) permits children to enjoy using tools and materials, as well as to enhance their reading, writing and speaking skills. Because ESIA is based on working with real objects, rather than retaining factual information, it has an appreciable effect on a child's education. "I hear and I forget. I see and I remember. I do and I understand." This is the basis of a program of ESIA.

[1]See Carl Gerbracht and Robert Babcock. Elementary School Industrial Arts (MacMillan Publishing Co., NY, 1969) supports the use of industrial arts activities as a necessary component of an elementary curriculum, grades K-6. In addition to the basic skills and tools, the authors describe the role of the industrial arts consultant within the school community. One section concerns hands-on experiences for students with special needs.

I. *I hear and I forget.*
II. *I see and I remember.*
III. *I do and I understand!*

When children's senses are actively involved in the learning process, education is more effective. Even during the 1800s, educators realized that education was more effective when students' senses were actively involved in the learning process. Dr. Mayo, an English educator, visited Johann Pestalozzi in Switzerland during the early 1800s to observe his school located in Yverdum. Mayo observed and recorded in his journal the following scene.[2]

> "One day, the master having presented to his class the engraving of a ladder, a lively little boy exclaimed, "But there is a real ladder in the court-yard; why not talk about it rather than the picture?"
>
> "The engraving is here," said the master, "and it is more convenient to talk about what is before your eyes than to go into the court-yard to talk about the other."



[2]Deguimps. Pestalozzi, His Life and His Work (Appleton and Company, 1895).

The boy's observation, thus ended, was for that time disregarded. Soon after, the engraving of a window formed the subject of examination.

"But why," exclaimed the same little objector, "why talk of this picture of a window when there is a real window in the room, and there is no need to go into the court-yard for it?"

Again the remark was silenced, but in the evening both circumstances were mentioned to Pestalozzi. "The boy is right," said he, "the reality is better than the counterfeit; put away the engravings, and let the class be instructed by means of real objects."

The value of learning from real objects and using sensory perceptions was also realized by New York City educators during the 1970s. Four years after the initiation and use of industrial arts activities at Publishing Activity Centers (PAC), teachers and field supervisors were delighted with their research findings.[3] It was determined that students who spent the most time in the PAC also gained the most skills in reading comprehension and word knowledge as measured by the Metropolitan Achievement Tests.

Whether ESIA activities are a separate content area (method approach) within the elementary curriculum, or are integrated within other subjects (correlated approach), children's mental and physical processes are similarly encouraged.[4] In summation, ESIA activities can help make education meaningful to children, as well as help educators to meet increasing demands for better services with limited resources.

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[3] Siegel, Herbert and others. The Effects of Industrial Arts Publishing Activity Centers on Reading Achievement Scores (The University of the State of New York, The State Education Department, Albany, New York 12224, 1978). This carefully evaluated research study concludes that one kind of ESIA activity significantly improved children's reading levels.

[4] For a look into the foundations of the ESIA movement, see Industrial Arts for Elementary Schools (MacMillan Company, 1923) by Frederick G. Bonser and Lois C. Mossman, formerly of the Columbia University Teachers College. Much of their philosophy still has value today.

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The impetus to provide an equitable education is not only civil rights laws, but startling consequences of how an inequitable education negatively affects childrens' future lifestyles.

Nine of ten girls today can expect to work in the labor force, six of ten girls can expect to work for at least 25 years, and four of ten girls can expect to become heads of household, supporting themselves and their children.[5] Although women are as well educated as men, women who work are concentrated in clerical and service occupations which provide less opportunity for advancement and less earnings than other occupations, such as managerial, technical and craft occupations. The reason for such a wide disparity between earnings and the types of jobs held by women and men is because they received different kinds of education, training and counseling. Typically, boys have been directed into high-paying jobs because they are expected to be breadwinners and to work in the labor force for over 30 years. That kind of thinking is no longer realistic. Today, girls should also be directed into high-paying jobs.

[5]Statistical projections are reported by the U.S. Department of Labor, Employment Standards Administration, Women's Bureau. For more information about preparing girls and boys for a changing work force, request "Parent's Handbook: Vocational Education For A Changing World" from the Pennsylvania Department of Education, Publications Unit, 333 Market Street, P.O. Box 911, Harrisburg, PA 17108.

After the passage of Title IX of the 1972 Education Amendments, which eliminates discrimination on the basis of sex, school programs and activities began to be equally available to boys and girls.[6] As a result, many school systems provide sex-integrated industrial arts programs. Girls now have an equal chance to understand how people produce and distribute products, thereby broadening their education of the mammoth industrial complex and their career aspirations.

Men and women are now accepting jobs based on personal preference and abilities rather than on sex-role stereotypes.

[6]One provision of Title IX requires school systems to self-evaluate its policies and practices. Schools are required to change policies and activities wherever violations are found, and to take remedial steps to help boys or girls catch up to an education that may have been previously unavailable. Because industrial arts, home economics and vocational education have traditionally been sex segregated and have created an adverse effect on both girls' and boys' career choices, remedial steps in these areas are necessary.

Career development theorists have found that industrial arts activities are ideal for girls who avoid activities traditionally done by boys.[7] Not only do industrial arts activities increase the likelihood of discovering new and more diversified career-related interests, ESIA activities also place young girls in simulated, non-typical career roles during their most formative years. Role-playing and new accomplishments can help reduce occupational stereotypes and reduce girls' avoidance of activities traditionally labeled "for boys only."

Since the passage of Title VI of the Civil Rights Act of 1964, which prohibits discrimination on the basis of race, color and national origin, many educational and work programs have emerged to help put an end to wide economic disparities between nonwhites and whites. Like women, minorities are under-represented in educational programs leading to more lucrative employment.

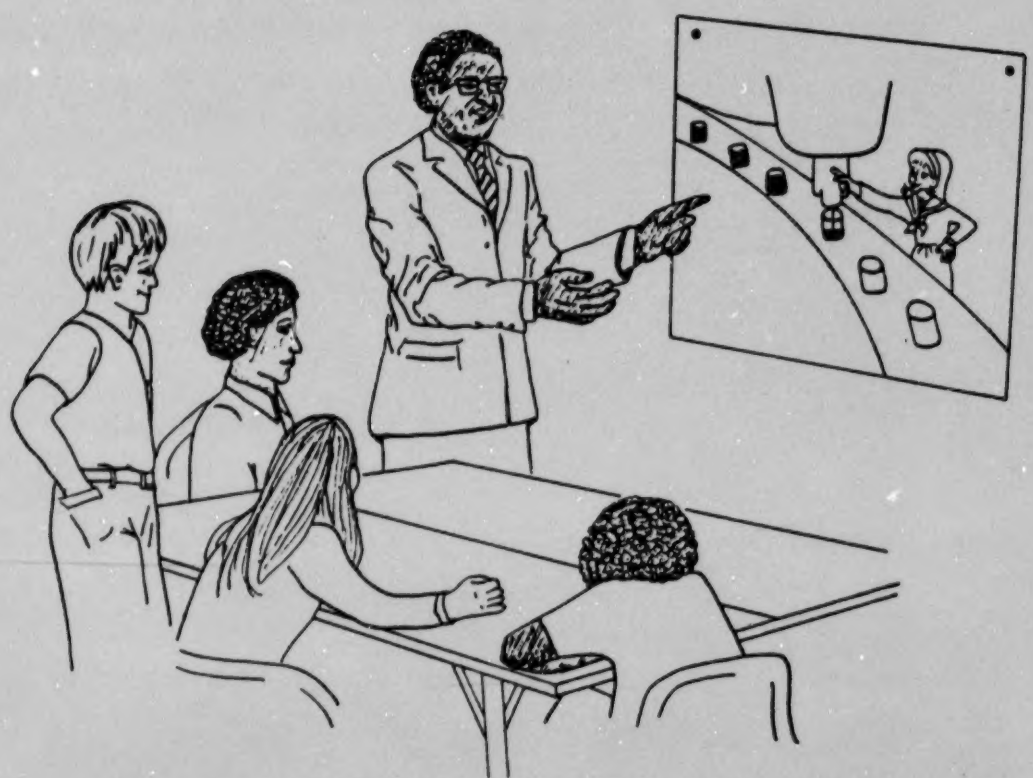
[7]For a description of the importance of industrial arts activities as a part of young girls' career education, see Sex Equity Guide for Industrial Arts Programs (Virginia Polytechnic Institute and State University, 1981), reprinted and available from the PA Department of Education, Thomas Winters, Bureau of Vocational Education.

A recent study supported by the NAACP Legal Defense and Educational Fund, Inc., found that black senior high school students enrolled in vocational education programs were over-represented in courses that prepare for low-wage, dead-end jobs. Industrial arts activities in elementary school are not the only answer to these problems, but they can offer minority children a better understanding of the total economic system and its diversity of career options.

Another important civil rights movement is one concerning physically and mentally handicapped children. Section 504 of the Rehabilitation Act of 1973, which prohibits discrimination on the basis of handicap, requires educators to provide opportunities for the handicapped equal to those provided the nonhandicapped.

In approaching the intent of Section 504, emotional and physical barriers which impede equal education for handicapped students must be addressed. An industrial arts program can contribute to eliminating some of the emotional barriers held by handicapped children themselves. The tendencies to accept dependence, to conform to inferior roles and expectations, and to lack self-understanding, require a "bridge" to overcome these self-imposed barriers and to foster independence, self-esteem and new expectations. An industrial arts program, whether it be conducted separately for handicapped children who cannot be integrated in regular classrooms, or conducted in classrooms of both handicapped and nonhandicapped students, can offer an important "bridge".[8] It can also facilitate their successful participation in secondary vocational education programs, and later in the labor force.

[8]Pre-vocational experiences for handicapped children are crucial to effective and appropriate placement in a regular vocational education program. For more information, see Marc E. Hull, Vocational Education For the Handicapped: A Review (The ERIC Clearinghouse on Career Education, The Center for Vocational Education, The Ohio State University, 1977).



Elementary-age school children learn about industrial production through observing, reading, discussing and simulated doing.

Reinforcing Quality Education

One favorable aspect of industrial arts activities in grades K-6 is its capacity to reinforce the twelve goals of quality education adopted by the Pennsylvania State Board of Education.

The next two pages describe benefits of an elementary education rich with industrial arts or constructional activities, and its relationship to the goals of a quality education.[9]

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[9]Benefits are based on those identified by W.R. Miller and Gardner Boyd, Teaching Elementary Industrial Arts (Goodheart-Wilcox Co., Inc., 1970). The authors support the use of correlated activities within the curriculum as the practical approach to an already overcrowded teaching schedule. Text includes descriptions of methods and materials of construction, tools and equipment, and the use of correlated activities.

The Goals of Quality Education, Commonwealth of Pennsylvania, were adopted March 8, 1979 by the State Board of Education.

GOALS OF QUALITY EDUCATION	BENEFITS OF INDUSTRIAL ARTS ACTIVITIES
COMMUNICATION SKILLS	. . . develop an increased desire to learn, to read, to discuss, to become technically literate, and to secure information. When constructing things to be put to immediate use, the purposes for reading, speaking, writing, and understanding the language of industry can become meaningful.
MATHEMATICS	. . . plan, measure, calculate, describe, draw, design, and use other skills inherent in construction. Facts, mathematics, computer applications, and analytical skills gained in other phases of the elementary education are practiced and used.
SELF-ESTEEM	. . . achieve success in a tangible form which builds self-confidence, and brings a measure of self-realization and pride in the finished work or product.
ANALYTICAL THINKING	. . . clarify, enrich and broaden students' understanding of concepts through first-hand experience, and develop problem-solving skills through practical applications.
UNDERSTANDING OTHERS	. . . produce objects or projects representative of those being studied for cultural awareness, or for use in dramatic play, in cooperation with other students.
CITIZENSHIP	. . . develop attitudes and appreciations of the necessity to accept and profit from suggestions, and to assume responsibility for a task that is important to the group as well as to the individual.
ARTS & THE HUMANITIES	. . . satisfy evidenced needs to build, to construct and to express themselves creatively; and appreciate artisanship.

GOALS OF QUALITY EDUCATION	BENEFITS OF INDUSTRIAL ARTS ACTIVITIES
SCIENCE & TECHNOLOGY	. . . increase students' understanding of ways industry and technology affect the production of consumer goods. By direct study of and experience with constructional processes, students can better comprehend the processes of industrial production as well as the materials used in production.
WORK	. . . develop certain behaviors, attitudes and appreciations to the educative process and eventual employment process. Constructional activity can act as a medium through which desirable behaviors and attitudes are developed, such as sticking to a task until it is finished, and putting tools and materials away for later use. Additionally, experiences can enhance career education and offer simulations of a wide variety of occupations in manufacturing, construction, communications and transportation.
FAMILY LIVING	. . . appreciate the mammoth industrial complex and its relationship to social and economic aspects of family life.
HEALTH	. . . enhance students' senses and psychomotor skills in a given learning situation, and develop attitudes, skills and habits related to safety.
ENVIRONMENT	. . . appreciate the use of natural and synthetic materials of production and the need to protect and maintain a favorable environment; including the need for alternate energy development and production.

Many persons, including classroom and industrial arts teachers, need to be involved in discussions of an ESIA program.

Decisions at the Local Level

The decision of whether or not to initiate a program of ESIA rests with administrators, teachers and school board members at the local level. Although curriculum requirements in Pennsylvania grant permission for a structured industrial arts component for grades K-6, it is not required.[10] However, guidelines and resources are available from the Pennsylvania Department of Education and from other agencies to assist administrators and teachers in developing an ESIA program.[11]

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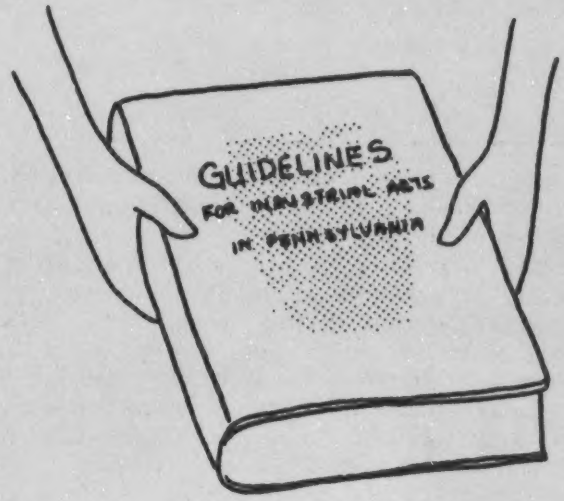
[10] Curriculum Requirements of the Regulations of the State Board of Education in Pennsylvania state that any planned course relating to fine arts, health, language arts, practical arts, science, and social studies may be integrated with other courses or may be taught separately (Pennsylvania Department of Education, 1978, p.9, c).

[11] In addition to the many resources footnoted in this guide, there are two monographs, Schools for Children (Monograph 1, 1976) and Problem Solving and Technology (Monograph 2, 1977) which can assist educators in developing an ESIA program. The former one considers various models, while the latter one deals with the development of educational technology. Both are available from the American Industrial Arts Association (AIAA), 1914 Association Drive, Reston, VA 22091.

Elementary schools are committed to developing the full potential of all children. Each child brings to the learning situation a unique profile of development which has resulted from the sum total of her or his past experiences. Educators must expand the experiences of children to bring them into fuller contact with the culture in which they are growing up. Elementary school industrial arts activities contribute in two principal ways to the educational development of children. First, they provide increased understanding of how people produce, distribute, consume and dispose of the products and services which technology has made available to them. Secondly, industrial arts activities provide children with direct contact with a wide variety of material things which broaden their experience base and assists them in dealing with abstract ideas in many areas of the curriculum.

-Guidelines for Industrial Arts in Pennsylvania



The purposes for ESIA are:

- Enrichment--industrial arts makes school a more rewarding experience for children by helping them to understand better the technological culture in which they are growing up.

- Stimulation--the motivational aspects of direct experiences with material things extend beyond the industrial arts activities to other areas of study.

- Integration--though enriching and stimulating in themselves, industrial arts experiences are most useful in helping children to integrate knowledge gained in many subjects into broad concepts which have meaning to them.

- Application--retention of knowledge and skills gained in all areas of study is enhanced when children have opportunities to apply what they have learned in concrete situations provided through industrial arts experiences.

Once the decision to implement ESIA is made, many questions and concerns should be resolved.[12] The next seven units of this guide provide guidance and suggestions for resolving these following questions and others.

Will this program be developed by an elementary classroom teacher or with the assistance of a trained industrial arts consultant?

Will there be a separate laboratory facility, or will each self-contained classroom include a mini-laboratory section?

Will there be an attempt to integrate the industrial arts activities with other subjects?

Will career awareness and accommodation play major roles in the industrial arts program?

Will federal or private funding be sought to supplement state and local monies?

Will there be a program of inservice education to maintain and improve teaching skills?

[12] A good resource to help develop curriculum in industrial arts, K-12, is Guidelines for Industrial Arts in Pennsylvania (Pennsylvania Department of Education, 1974).

Also, see Hoots, William R., Jr., Editor. Industrial Arts in the Elementary School: Education for a Changing Society (National Conference on Elementary School Industrial Arts, East Carolina University, Greenville, North Carolina, 1971). It's an excellent place to begin a study of elementary school industrial arts. Twenty-one leading educators met periodically to distill into less than thirty pages their experiences, perceptions and philosophies of industrial arts in grades K-6. Topics include definitions of ESIA, philosophical basis, organizational approaches, leadership, teacher education and dissemination. Reprints are available from the AIAA, 1914 Association Drive, Reston, Virginia 22091.

Relevant Research

Does ESIA Really Work?

Relevant Research: Does ESIA Really Work?

Questions often asked by educators who are considering an ESIA program are: "Does it really work?" and "What changes will be evident in our children if we include ESIA activities in the classroom?" Several studies have been done to evaluate the impact of constructional activities on students' cognitive development (content) and affective development (attitudes). These studies offer evidence of children's higher achievement scores, improved attitudes toward education, and enhanced academic readiness and self esteem following participation in a constructional activity.

While examining the question, "Why can't Jane and Johnny read?" the New York State Education Department, in cooperation with the New York City School System, conducted a study to determine the benefits of industrial arts learning activities, titled Publishing Activity Centers (PAC). Over 1,500 elementary students from various socio-economic backgrounds participated in visual communications activities at the PAC to supplement regular classroom lessons. Periodically, children's reading achievement was analyzed to determine changes in subtest scores.[1] The analysis revealed that activites at the PAC had a positive effect on reading achievement scores during the second year

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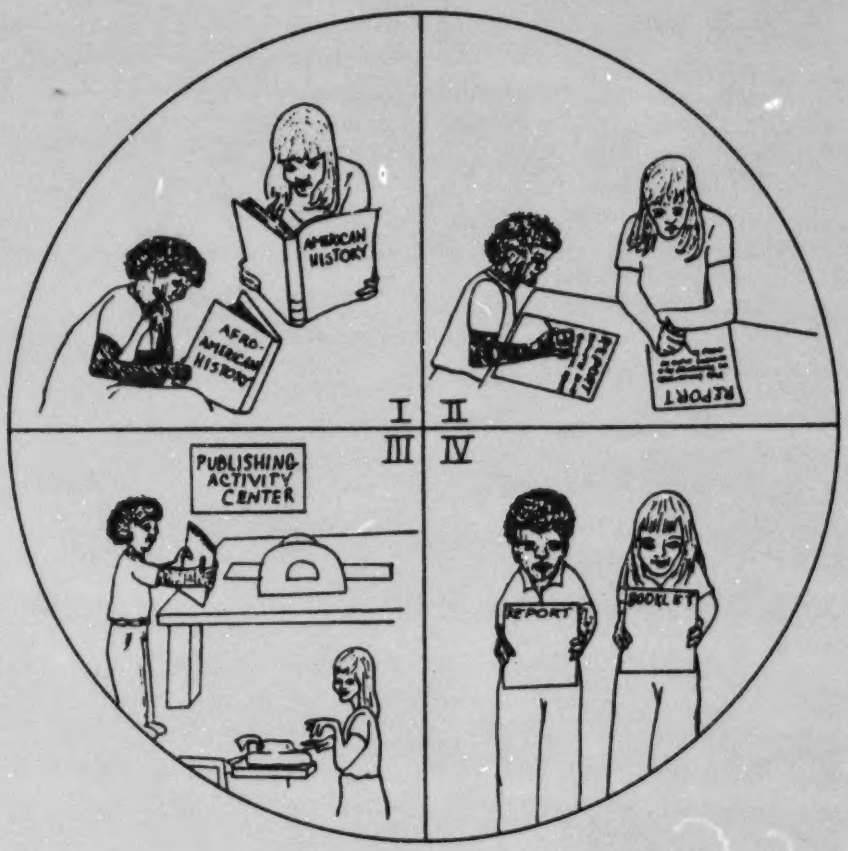
[1] Siegel, Herbert and others. The Effects of Industrial Arts Publishing Activity Centers on Reading Achievement Scores (The University of the State of New York, The State Education Department, Bureau of Occupational Education Research/Bureau of Industrial Arts, Albany, New York 12224, 1978).



Publishing Activity Centers at the New York School System enabled elementary students to: (I) perform individual reading assignments, (II) develop writing skills, (III) type and reproduce hard copy, and (IV) experience success by becoming a publisher.

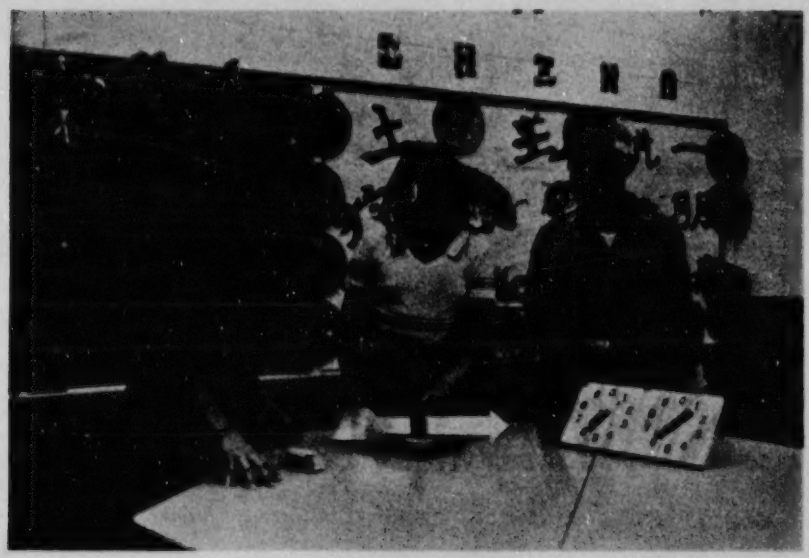
of the program and thereafter. Also, individual test score gains were directly proportional to the number of contact hours spent at the Publishing Activity Centers.

In another study, achievement levels and its relationship to several constructional activities were compared in the curriculum area of science for 360 fifth grade students. Regardless of ability level, achievement scores of students who constructed aids directly related to a unit under study were significantly higher than scores of students who constructed aids indirectly related to a unit under study or who did not have a constructional experience as a part of a unit under study.[2] The study concluded that using constructional activities to teach science at the fifth grade level was more effective than a traditional approach to teach science.

In a similar study of achievement levels of third grade students, there were several positive findings of the effect of a constructional activity upon the understandings of scientific principles. The study

[2]Downs, William A. The Effect of Constructional Activities Upon Achievement in the Areas of Science and Mathematics at the Fifth Grade Level (unpublished doctoral dissertation, University of Missouri-Columbia, 1968).

revealed there were significantly higher achievement test scores for the total group, including both high and low mental ability subgroups, following experiments with simple machines.[3] It concluded that an appropriate constructional activity in a science unit involving simple machines can enhance the achievement of third grade pupils, regardless of their mental ability.[4]



Through the use of hands-on constructional activities, students experience the effects of simple machines in both the final projects and tools involved in scientific study and practical applications.

[3]Logan, Noah. The Effect of a Constructional Activity Upon Achievement at the Third Grade Level (unpublished doctoral dissertation, University of Missouri-Columbia, 1973).

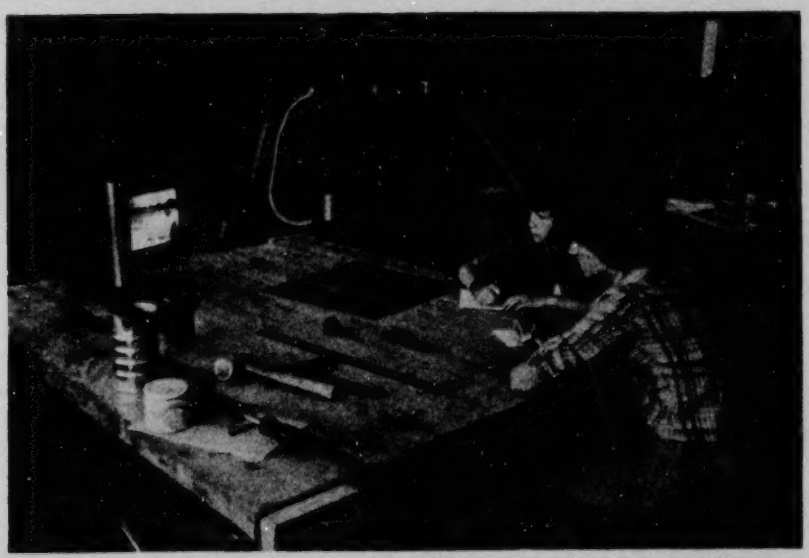
[4]See Dahl, Richard J. Implications of Piagetian Theory for Early Childhood Industrial Arts: Cognitive Development. (Monograph 6, American Council for Elementary School Industrial Arts, 1979). The author reviews the learning theories of Jean Piaget, and shows how industrial arts experiences can contribute to the development of young children, ages 3 to 8. Available from the AIAA, 1914 Association Drive, Reston, Virginia 22091.

One area of the elementary education curriculum which is often underestimated is physical play or movement activities. Much research supports the theory that physical play or movement activities are an important developmental aspect of childhood and academic readiness. Once enrolled in an elementary school, however, movement activities are often limited to unstructured play outside the classroom.

A needs assessment of almost 800 students, K-4, indicated the 59 percent of the students exhibited some kind of deficiency in the psychomotor area concerned with the initiation of auditory, visual, tactile and kinesthetic stimuli, for which conventional curriculum organizations did not provide. Following the needs assessment, a special program based on psychomotor training to enhance academic readiness and self-esteem was implemented over a three-year period and validated as successful and effective.[5] Although the program involved simple movement activities (skipping, jumping rope, shuttle running, walking on a balance beam, playing with marbles and balls, drawing pictures, and copying designs and sentences from a chalkboard), it showed how structured movement activities could improve form perception, visual motor coordination, auditory awareness, fine motor

[5]Steele, Wah-Leeta. Project ADAPT: A Developmental Approach to Psychomotor Transfer. A Guide to Movement and Learning (U.S. Department of Health, Education and Welfare, Office of Education, 1976).

coordination, gross motor coordination, and sensory motor systems, to name a few.[6] No claims can be made by the writers of this guide that movement activities in an ESIA program can alone enhance children's academic readiness. However, an ESIA program is one way of providing for both psychomotor skills and cognitive bridges in order to enhance intellectual abilities.[7]



[6]See Hauenstein, A. Dean. Curriculum Planning for Behavioral Development (Charles A. Jones Publishing Company, 1972). A text and workbook for the development of curriculum at all levels of industrial education. It offers a new look at the identification of behavioral development often associated with student accomplishment. The author emphasizes the use of "doing words" or verbs in his approach to the teaching of psychomotor skills.

[7]See the sample lesson plan in this guide for an example of how cognitive bridges and psychomotor skills are built into the ESIA activity of making paper.

Children's success in psychomotor activities and in cognitive development activities can obviously enhance their self-concept. It is this "good feeling" that motivates a child to learn more, and consequently improves attitudes among teachers. For example, at a school district in Texas, elementary teachers who integrated their disciplines with industrial arts activities had very positive attitudes toward the integration.[8] An analysis of responses to an attitude questionnaire showed that principals and teachers believed industrial arts activities should be part of the curriculum, that these activities were not too dangerous or too messy, that they were highly motivational, and that they did not create noise problems.

Several other studies also reveal improved affective development. One study concluded that integrated industrial arts-social sciences in grades four through six improved children's concept of learning.[9] Similar conclusions were made in another study of integrated industrial arts-science classes in an elementary school.[10] Another unrelated study revealed that both teachers and students in grades four through six preferred integrated industrial arts-science instruction over the

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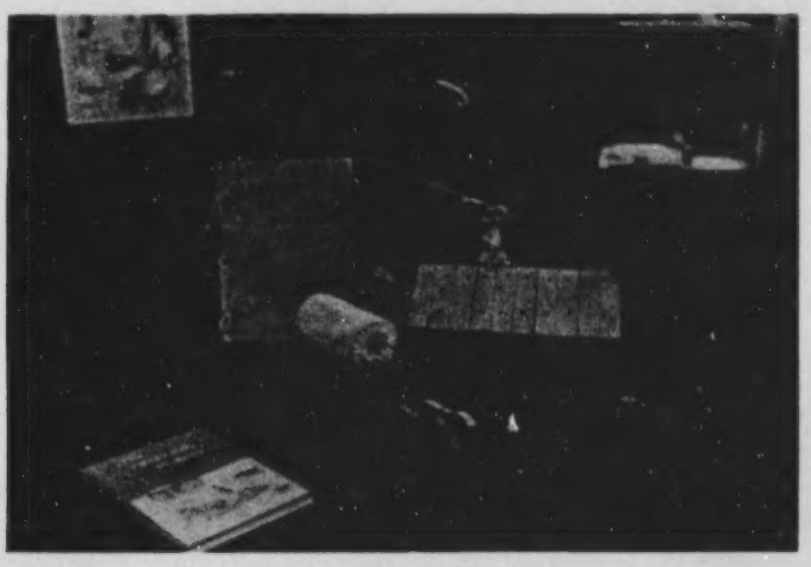
[8]Tuckey, Charles E. Attitudes of Elementary Principals and Teachers Toward Using Industrial Arts Activities Within the Dallas Independent School District (unpublished doctoral dissertation, East Texas State Univerity, 1978).

[9]Ingram, Franklyn C. The Effect of Elementary School Industrial Arts on Pupils' Studies Achievement (unpublished doctoral dissertation, The Pennsylvania State University, 1966).

[10]Champion, George. The Interrelationships of Industrial Arts with Science in the Elementary School (unpublished doctoral dissertation, University of Maryland, 1965).

traditional learning mode.[11]

Constructional or industrial arts type of activities can be "fun." The benefits, however, will not just happen. What is required is structured activities that plan for specific objectives related to psychomotor and cognitive development. An ESIA activity or program is one way to provide structured activities that are integrated with the elementary education curriculum.



Educational experiences can be more effective when students have the opportunity to read, write and construct projects related to the curriculum.

[11]Pershern, Frank R. The Effect of Industrial Arts Activities on Science Achievement and Attitudes in the Upper Elementary Grades (unpublished doctoral dissertation, Texas A & M University, 1967).

The World of Work

Can ESIA Enhance Career Education?

The World of Work: Can ESIA Enhance Career Education?

While most educators commonly associate the goal of preparing students for employment at a higher level than K-6, curriculum planners are recognizing career education as a valuable component of elementary education. Supporters of career education advocate that it should continue throughout a youngster's stay in school, from the first grade through senior high school and beyond.

One value for integrating career awareness and industrial arts activities in grades K-6 is the recognition that attitudes of children regarding their work roles may be well developed by the age of 12. By age 16, youth's expectations of their work roles are not only well developed but also limited to only a few of the thousands of careers available. In a study conducted by the Pennsylvania Department of Education, "Sex Differences in Vocational Attitudes and Knowledge of Eleventh Grade Students in Pennsylvania, 1978," the author suggests that the relatively low scores on the EQA Vocational Knowledge Test indicate that a student's familiarity with job responsibilities and duties is limited to certain traditional occupations which have high visibility, and which require postsecondary formal education. Careers in industry such as metal molders, millwrights and jobsetters were not

chosen, probably because students who participated in the study were unfamiliar with those job titles and descriptions. The author also concludes that sex-role stereotypes, as well as the constraint of what is known, may be main influences upon occupational expectations.

When this study is viewed in light of the knowledge that economic indicators are predicting a labor market need for women and men who are highly skilled technicians and artisans, the need for educators to respond to a changing world of work is quite evident. An awareness of less visible and "new" or emerging careers is an important aspect of industrial arts activities. Such activities not only offer meaning and value to the elementary school curriculum, but also encourage girls and boys to re-examine occupational stereotypes and to remove constraints of what is known.

Because of its dependence on the traditional curriculum, career education has been identified as an emerging concept[1] for additional development. Its goals, however, are to increase career options available to girls and boys, and to facilitate more rational and valid

[1]Sidney P. Marland, former U.S. Commissioner of Education, defined career education (American Education, November 1971) as a point of view; a concept that should be integrated at all grade levels to help students gain skills to begin making a livelihood.

career planning and preparation[2]. Through a wide range of school and community-based resources, career horizons of children can be broadened and their self-awareness can be enhanced. The framework for accomplishing these goals is career awareness, career exploration and career preparation. Elementary school industrial arts can play a major role in career awareness and exploration by introducing children to new skills and occupations.[3]

[2]Goldhammer, Keith and Robert E. Taylor. Career Education-Perspective and Promise (Charles E. Merrill Publishing Company, 1972). Presents series of articles and speeches in defense of this new approach to education at all levels. One section describes several K-6 model projects which tried to use career awareness as a goal or objective during the early 1970's. This book deals with the "why" rather than "what" to teach.

[3]For a full discussion on how many approaches to career education in the elementary school draw upon the philosophies and methods of elementary school industrial arts, see Elementary School Career Education, AIAA "Focus" series, 1971 (American Industrial Arts Association, 1914 Association Drive, Reston, VA 22091).

The planning of curriculum to bring about an awareness of one's self in relationship to the world of work needs a basic guide. One suggestion[4] for career education in grades K-6 includes the following steps.

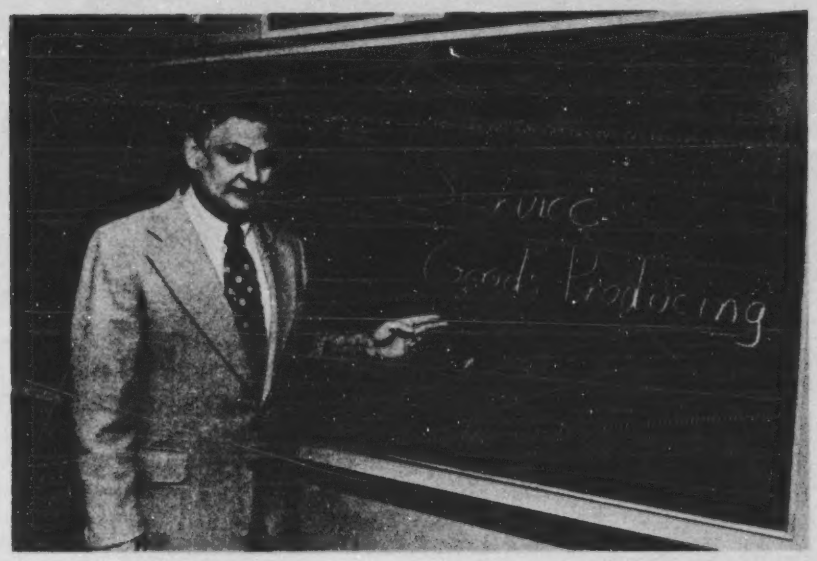
AWARENESS STAGE - GRADES K-3

Unit I Activity. As a starting point for learning about self and the broad world of work, the child needs to be aware that day-to-day activities are purposeful. She or he should be able to identify some of the reasons for human activity.

Specific objectives will be concerned with having students identify and compare their activities throughout the day, develop broad definitions of work and play, and discuss activities of self and others in terms of work-play classifications.

[4]Bailey, Larry J. "Career Development at the Elementary School Level," Industrial Arts and Space Age Technology (American Industrial Arts Association, 1971), pp.274-277.

Unit II Interests and "Fantasy" Preferences. Unit II builds on Unit I by moving from awareness to identifying relationships between what a person likes to do and possible future occupational roles. By using the natural tendencies of children to fantasize about occupations, more realistic attitudes and understandings of occupational choices can be developed.



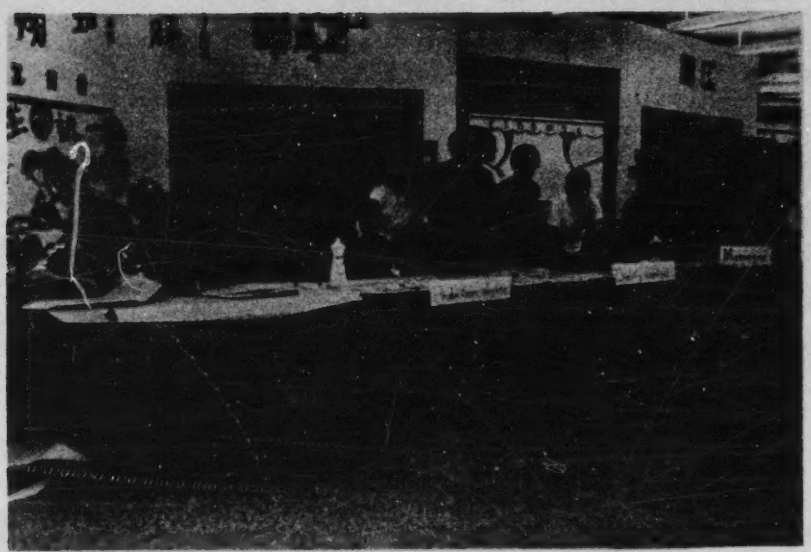
Unit III Occupational Roles. In Unit III, the child is introduced to the classification of work activity in terms of goods and services production. An examination of the necessity for both goods and services leads to an understanding of the interdependence of occupational roles. A consideration of various worker roles involved in providing services or producing goods is designed to show the range of possible occupations within the student's areas of interest.

ACCOMMODATION STAGE - GRADES 4-6

Unit IV Self Appraisal. At this level, self appraisal becomes more meaningful as students examine their interests and abilities for change as a result of maturity and education. Opportunities are provided for individuals to express interests, exercise talents, and explore areas in which to develop new interests and abilities. The focus on self-understanding is intended to be a further step in assisting the process of self-concept formation.

Unit V Occupational Families. In Unit V, students become more familiar with occupational classifications and a wide range of possible occupational roles. An understanding of goods and services classification is extended to include a familiarity with "occupational families" which are contained within the goods and services classifications. An important aspect of this level is that students, in a laboratory situation, will "try on" occupational roles representing each of several specific job families.

Unit VI Understanding Career Development. The purpose of this level is to make students aware of the need to formulate preferences and make decisions. It introduces the fact that individuals have some control over their future career through careful planning and decision-making. Students can also become acquainted with the multiplicity of factors that influence vocational behavior and development. Experiences are structured which relate the importance of attitudes toward education, and of planning one's own future.



In this activity of manufacturing kites, intermediate-level students have the opportunity to "try on" various careers.

Program Objectives

While the preceding description suggests sequential units to establish a basic understanding of career education, curriculum planners at the local level should identify or establish specific program objectives. Curriculum planners at one school district developed such a listing but went several steps further and asked parents and classroom teachers to rank sixteen objectives from "most important" to "least important." The following chart[5] indicates the correlation between those career education objectives and industrial arts activities which can play a major role in implementing the objectives.

[5] Pace, Vito R. "Implications of Career Education Objectives for Elementary School Industrial Arts," Industrial Arts and a Human Technology for the Future (American Industrial Arts Association, 1974), pp. 152-154.

OBJECTIVES LISTED IN RANK ORDER Upon completion of the sixth grade, children will be expected to . . .	CORRELATION WITH INDUSTRIAL ARTS
1. . . . identify relationships between school learning and the world of work.	Demonstrate concepts in technology through activities and relate concepts to operations and occupations; provide experiences correlating concepts taught within the curriculum as utilized by humanity through technology.
2. . . . explain how their abilities and interests relate to various occupations.	Provide opportunities to explore and become aware of self-concepts in relation to likes and dislikes in working with a variety of tools and materials.
3. . . . identify the values of work for the individual and society.	Provide opportunities for individuals to become contributors through involvement in simulated work activities.
4. . . . describe the value of all workers, regardless of occupation.	Opportunity to experience team or group experiences in working with tools and materials--group dependency on individual and individual dependency on the group.
5. . . . describe how workers depend on each other (cooperation).	Study of mass production techniques.
6. . . . describe the purposes of work to the individual and society.	Explore the value of work in relation to societal goals --technology as a contributor to environmental conditions.
7. . . . explain how attitude toward work affects the employee and the employer.	Explore the effects of attitude on degree of success of technological endeavors--quality control, customer satisfaction, etc.

8. . . . develop elementary mental and physical skills in a number of career-related tasks.	Provide opportunities for children to experience actual contact with planning and executing activities in a variety of media in industrial arts.
9. . . . know how to obtain information about a variety of occupations.	Provide resources pertaining to occupations as they relate to areas in technology.
10. . . . describe how hobby and recreational activities may relate to future careers.	Provide opportunities to explore hobbies related to industrial arts, correlating concepts with possible employment application.
11. . . . explain the idea of reward (pay and others) for satisfactory work performance.	Develop concepts of economics in relation to industry, noting the system of finance related to commercial endeavors.
12. . . . explain how various occupations relate to wide ranges of social and economic benefits.	Relate through research and observation various occupations in technology requiring a wide range of skills and ability that are often related to income and social status.
13. . . . describe how different occupations take place in different settings such as factories, offices, hospitals, etc.	Through concrete experiences and on-site visits, provide an awareness of the environment and working conditions and expectations for a variety of industrially-related occupations.
14. . . . explain the difference between workers who produce goods and those who provide services.	Through activities, provide experiences which define the roles of the producers and the servicers of technological equipment.
15. . . . express general likes and dislikes about different occupations.	Through actual or simulated activities, provide children with the opportunities to evaluate their likes and dislikes in relation to a variety of industrially-related occupations.
16. . . . identify the most common occupations in the community.	Utilize community resources such as people and facilities to explore occupations performed in the local community.

Dictionary of Occupational Titles

One valuable reference to use when structuring educational experiences on the world of work is the Dictionary of Occupational Titles (DOT).[6] This publication contains information about current employment practices for almost 20,000 different occupations practiced in the American work force of over 100 million women and men.

The DOT uses nine major categories under which the above mentioned 20,000 occupations are grouped. The nine major divisions are for organizational purposes, and are easily used and understood. The categories are:

Professional, technical, and managerial occupations

Clerical and sales occupations

Service occupations

Agriculture, fishery, forestry, and related occupations

Processing occupations

Machine trades occupations

Benchwork occupations

Structural work occupations

Miscellaneous occupations

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[6]This publication of the U.S. Department of Labor is available at libraries or career guidance offices. It's also available from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 (202-783-3238).

The following provides some practical suggestions for how this wealth of information can be used in the elementary school classroom. For example, in the awareness stage (Unit I), students can discuss how careers presently observed in their community are included in the world of work and the DOT. In Unit II, children can be encouraged to fantasize by answering this question: "What would you like to be when you grow up?" To continue this development in Unit III, students can be given an opportunity to identify various occupations in their community as either goods-producing or service-oriented. In Units IV to VI, students can begin to appraise their own self interests and abilities (Unit IV), become familiar with occupational classifications (Unit V), and to formulate preferences (Unit VI). In these efforts, which are often correlated with a study of social sciences and industrial arts, the use of the DOT could provide students and teachers with definitions for specific occupations. On the next page are two examples of definitions for specific occupations listed in the DOT.

MOULDING-MACHINE OPERATOR (sports equipment)

Operates press to cast resined glass into glass bows: Cleans molds and applies wax to mold, using swab. Cuts glass from winder reel and places glass into mold to fill mold as specified. Pulls top mold and presses down into position. Opens press and removes bow. May keep production records.

DUMP-TRUCK DRIVER

Drives truck equipped with dump body to transport and dump loose materials, such as sand, gravel, crushed rock, coal, or bituminous paving materials: Pulls levers or turns crank to tilt body and dump contents. Moves hand and foot controls to jerk truck forward and backward to loosen and dump material adhering to body. May load truck by hand or by operating mechanical loader. May be designated according to type of material hauled as COAL HAULER; DUST-TRUCK DRIVER; MUD TRUCKER. May be designated according to type of equipment driven for off-highway projects as DUMP-TRUCK DRIVER, OFF-HIGHWAY.

Occupational Outlook Handbook

Another reference for intermediate-level students is the Occupational Outlook Handbook. It begins with a section on how to evaluate one's abilities and interests and to correlate likes and dislikes with occupations. It asks questions such as "Are you a good follower or someone whose greatest rewards come from directing others in a work effort?" and "Do you like frequent contacts with other people or do you prefer to spend a lot of time alone?" Following the self evaluation, the handbook suggests compatible occupations and describes the nature of the work, places of employment, training and other qualifications, employment outlook, earning and working conditions, and sources of additional information. Many occupations described include illustrations or photographs.

This publication of the U.S. Department of Labor is often used to complement information contained in the Dictionary of Occupational Titles, and is available from the same source.

Audiovisual Aids

In the development of curriculum to instruct young children in the world of work, teachers and administrators should review and select relevant audiovisual aids such as 16mm educational films and slide-tape presentations. These materials are often available on a loan basis from the IMS Center[7] at the local intermediate unit. They can also be purchased from commerical distributors at a relatively low cost. While these teaching materials can also be developed by the teacher, the use of commercial audiovisual aids should be considered in light of their cost, availability and effectiveness.

In regards to their content, the title and subject can be of a general nature, such as, "The Work People Do," or "Different Jobs." They can also be of a more definite design, such as, "My Mommy is a Bricklayer" or "My Daddy Makes People Laugh." When purchasing or borrowing materials, the teacher should be aware of portrayals of sex-role occupational stereotypes and racial stereotypes associated with an occupation.[8] If outdated materials do perpetuate stereotypes, the material can be used to encourage a discussion among students about occupational stereotypes.

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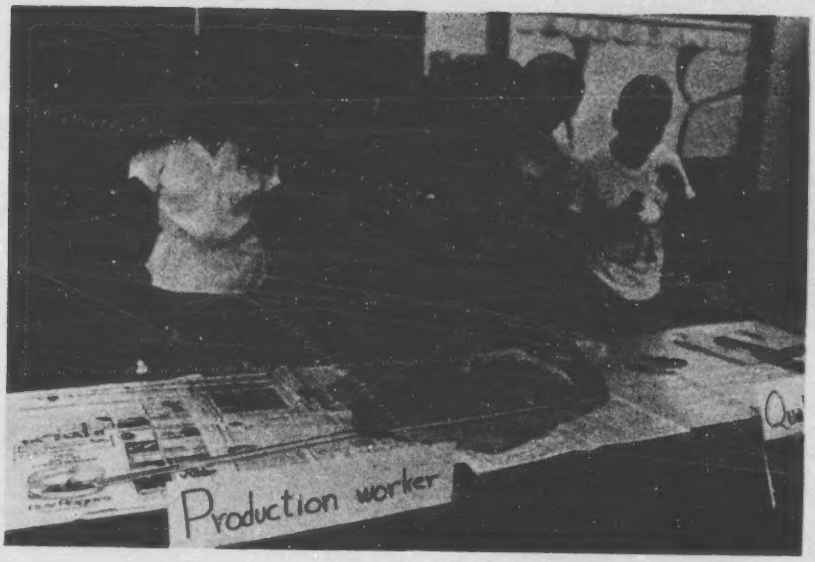
[7] In addition to the IMS Center, the Vocational Education Equity Program (VEEP) of the Pennsylvania Department of Education, P.O. Box 911, Harrisburg, PA 17108, loans audiovisual materials to teachers. Contact VEEP for an annotated listing of materials.

[8] Freestyle (National Institute of Education, 1979), a television series of 13 dramatic half-hour stories, is available to transfer on educators' videotapes. Stories show viewers, ages 9 to 12, how boys and girls can discover new activities, new career-related interests, and new behaviors when they understand how sex-role stereotypes limit their lifestyles. Contact VEEP, PA Department of Education, P.O. Box 911, Harrisburg, PA 17108.


Production worker

Teaching Strategies

While teachers may wish to develop their own approaches and adaptations to career awareness, some suggestions in regards to the use of interviews, student research, class meetings, field trips and simulated work experience are offered in the next few pages.[9]

Interviews. An interview with an employee which is conducted by a class or individual student is an excellent means to develop skills and understandings in research, inquiry, listening and communicating. Some specific suggestions are listed below.

- Develop with the class, by means of the class meeting, rules and procedures for interviewing.
- Once the rules and procedures are established, let the children practice interviewing each other with audio or video tapes to develop self-confidence in the interviewing process.

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[9] Kennedy, Elsie and others. Career Awareness Suggestions for Teachers (Curriculum Development Center, Vocational Education, University of Kentucky, Lexington, Kentucky 40506, 1972). This is a teacher's guide on the goals of career education in grades K-6, and includes various suggestions on methods for conducting classroom activities. This effort was obviously written by a group of teachers for local use. Since ESIA and career awareness have many overlapping needs, this is an excellent reference for teachers to use on a daily basis. Copies are currently available at a modest cost by writing to the above address.

General Procedure

1. Choose one child as the interviewer.
2. A day or two before the interview, let the class discuss the questions they feel would benefit them to ask the guest. These can be supplemented by the teacher in a skillful way.

3. The chosen child is responsible for conducting the interview. If the interview is conducted in front of the class, a general question period can be held after the initial interview.
4. If the interview is a private one, the child should report the results of the interview to the class.
5. Always have the child write a thank-you note to the guest.
6. Try to use as many local people as possible, as these are people who work at places which are more visible to children. Try to choose people who work at jobs nontraditional to their sex or race (for example, a male nurse or a Black pharmacist).
7. Invitations for speakers may be made by a teacher or student. Establish class procedure if students make the invitation.
8. Remind the students of the skills of speaking in turn and being a good listener, and not to interrupt, change the subject, or ask the same question.

Examples of Questions

1. What schools did you attend?
2. What is your present job?

   How did you get it?

   How long have you worked there?

   What time do you go to work?

   What do you do on the job?
3. What things do you like most about your job? Least? Are there any hazards?
4. What is the usual starting salary in jobs like yours?
5. What qualifications do you need to get the job?
6. What preparation do you need?
7. What is the outlook for the future? Advancement? Supply and demand for workers?
8. Hours: Regular? Overtime? Evening? Sunday? Holidays? Steady or seasonal?

Research. While the amount and manner of research is dependent upon the development of the individual child, it can be done in various ways. It could include conducting interviews, viewing films and filmstrips, listening to records and tapes, reading books, using charts, writing letters, consulting magazines and newspapers, viewing television, attending field trips, consulting projects using tools and materials, collecting data, analyzing data, making conclusions and writing reports.

A personal interest in a music career can be the motivating force when doing research that includes reading, writing, planning and constructing a guitar in industrial arts class.

The child can be encouraged to keep an account of the information that he or she has found, to classify and compare it to other sources, and to determine which information to keep. It should be noted that the findings of this research can be presented in various ways, in addition to the written report, such as the production of audio tapes, charts, pictures, drawings, notebooks, displays, video tapes, 8mm film and industrial arts projects.

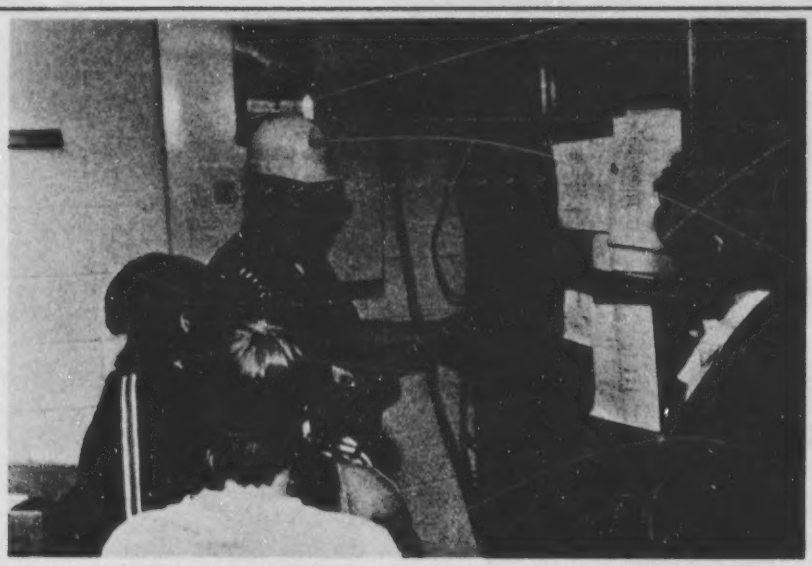
Class Meetings. This approach can be used by the elementary teacher, the industrial arts consultant or a team effort involving both. The initial suggestion would be the creation of an aware, free and accepting atmosphere in the classroom. After guidelines have been established by the class prior to the meeting, the teacher should assist students in learning how to use these predetermined rules during class meetings. Some examples would include how to be a good listener, not to interrupt others when they are speaking, to keep to the subject, not to dominate the conversation, to wait your turn patiently, and to raise your hand when someone else is speaking.

A class meeting should not be a lecture nor a teacher-child exchange employing positive and negative reinforcement. The teacher should accept students' ideas without being judgmental. The role of the teacher in these class meetings can be described as a leader in a silent manner. In this function, it may be necessary to break a long pause, start the discussion, or involve a quiet or shy student in the activity. The attention should be focused on the group and not its leader. More specifically, the teacher may play any or all of the roles described on the next page.

Initiator:	Suggests to the group ideas for discussion or poses a problem to be solved. Can also be used for task orientation.
Clarifier:	Shows or clarifies the relationships among various feelings, ideas, and suggestions or tries to integrate feelings, ideas, and suggestions.
Interpreter:	Interprets feelings expressed by members of the group, or interprets the significance of non-verbal behavior.
Reflector:	Reflects feelings expressed by members of the class. Usually limited to individual feelings expressed.
Expediter:	Encourages and facilitates the participation of others. Stimulates the discussion to a higher degree. Prods the class to a decision.
Evaluator:	Subjects the accomplishments of the group to some standard in the context of the group task.

The following suggestions are offered for using field trips as a means of exploring the world of work in grades K-6.

1. The class and teacher together arrange an appropriate time.
2. The arrangements can be made by the teacher.
3. The teacher should know the place to be visited and be aware of the important things to see.
4. Background information should be gathered by doing research before the trip.
5. The class and the teacher should plan together what they expect to see and what questions they should ask. In some cases, responsibility for asking those questions might be delegated to certain people.
6. The trip should be evaluated by the class upon their return. For example: Were our plans adequate? Were our questions appropriate? Were questions answered to our satisfaction? What things did we observe that were new to us? What new questions do we now have?
7. Follow-up activities such as reports, charts, bulletin boards, murals, etc. should be conducted.
8. A thank-you note, including the children's observations, should be sent. A student should be responsible for the note.



Students view first-hand the effects of electrical current, industrial processes, and the duties and responsibilities of management and production workers in industry.

Field Trips. The field trip is an excellent means of observing careers on a first-hand basis. The roles, responsibilities and interrelationships of workers are viewed in their real-life settings. In this manner, the community becomes the classroom for the individual, a small group or an entire class. With the exception of the imaginary field trip, this experience could occur within the school building, the home, the neighborhood or the city. The teacher has the option of using field trips as either the initial or culminating activity depending upon local objectives and conditions.

Simulated Work Experience. There is only so much students can achieve through reading, observing, discussing and listening. Simulated work experiences can be used within the school setting to provide additional experience. There are many specific approaches to designing these experiences.[10]

> The simplest and most traditional approach is to create a series of specified "jobs to do" within the classroom, and assign students to each job on a rotating basis. Such "work tasks" as passing out workbooks, taking roll, directing traffic within the building, supervising playground time, picking up class assignment papers, and keeping coat closets neat and orderly are examples of work that are typically assigned to elementary students.
>
> Where this approach is used, there is little direct time taken from instructional activities per se. While some elementary teachers have viewed this as an advantage, it in fact represents a potential danger. That is, simply to assign work tasks in no way guarantees that students develop any real concepts regarding the nature of work. They may simply feel that the teacher is taking advantage of them. Thus it is important, if this is the approach to be used, that the teacher take time to make sure that students understand that they are demonstrating, through their actions, such basic work concepts as the social significance of work, the inter-dependence of workers on one another, the necessity for workers to cooperate with one another, the importance of completing assignments on time, the principle of worker

[10] This section, "Simulated Work Experience," is adapted from Career Education and the Elementary School Teacher, by Kenneth Hoyt and other authors (Olympus Publishing Company, 1973). It is an excellent source to research all aspects of career education and the elementary school program. It begins with a discussion of career education in general, describes academic learning through career awareness and exploration, career development in grades K-6, societal relationships, and teacher development. In some areas, class activities are also given for the instructor's use.

responsibility for carrying out assignments, and the way in which each worker contributes to some broader objective than can be seem from viewing only the specific work tasks assigned to him or her.

A more sophisticated approach to simulated work experience is the "product outcome" technique oriented around a "company" formed by the students. This approach asks the teacher to help the children think of a product or a service they wish to produce or offer, organize the management-worker system required, assign various students to different roles in the "company", actually "manufacture" the product (using assembly-line techniques), package it in some form, and then make it available either to students within the school or to persons outside the school. Such an approach is not only more authentic but, in addition, allows students to explore the nature of a wide variety of occupations.

Examples of "products" that have been "manufactured" in projects of this nature include puzzles, wall plaques, artificial flower arrangements, note pads, doll clothes, silk screened posters, and games of various sorts. (...) In some schools, this type of project has been carried to the point where "stock" is sold, with the various "stockholders" receiving dividends on their investment at the end of the project--depending upon the success found in marketing the product. Where several teachers in a single building are using this approach, competing companies may be established that add a still further note of realism to the entire simulation effort (pp. 111-113).

An ESIA activity in mass production gives these intermediate-level students an opportunity to create, produce and sell a manufactured item. In addition, they gain a valuable background by completing various management and production functions needed to make a kite.

It should be emphasized that the preceding approaches to the use of simulated work experience are not the only options available. For some situations, local conditions might indicate a need for other activities. While teachers can develop their own approaches, these additional examples[11] may assist them in this effort.

1. Develop and construct "experience charts" for one working adult in each student's family. This could include the use of audio tapes, photographs, drawings and text material.
2. The use of television series can be reinforced with gaming techniques on various aspects of career education. The various possibilities might involve spelling bees, crossword puzzles or riddles.
3. Collect clothing, tools and apparatus which depict various careers in the immediate community. A system of storing and categorizing should be developed by the students for future use in role playing, for example, a nurse's cap or a miner's helmet.

[11] Hoyt, op. cit., pp. 113-114.

4. The construction of a wall mural to depict community workers who provide food, protect us, teach us new skills, entertain us, keep us healthy or get us from one place to another.

Learning Environments

Where Can We Do ESIA Activities?

Learning Environments: Where Can We Do ESIA Activities?

A variety of settings within or near the elementary school building can be conducive to industrial arts activities. Although the setting could be any environment where students are able to successfully work in a safe and supervised manner, popular settings for ESIA activities are the self-contained classroom, the separate laboratory facility, and the mobile laboratory. In reality, the approach is often a combination of these learning environments, depending upon local needs and resources.

This self-contained classroom includes a learning center arrangement.

The self-contained classroom that uses a learning center arrangement is a flexible design permitting children to rotate through various assignments as they are successfully completed rather than waiting for others to finish.

The Self-Contained Classroom

The most common setting to teach ESIA activities is the self-contained classroom. Because instruction in other subject areas occurs in the self-contained classroom, it is also the most likely place to learn about the proper use of tools and materials. Some benefits of this approach include the following.

- The movement of students to another facility is not necessary.
- Students are able to see the interrelationships of industrial arts and the other subjects found in the K-6 instructional program.
- The classroom teacher is able to be present during all activities to provide instruction and supervision to the students.
- The use of a separate laboratory facility may not be available to the classroom teacher or the industrial arts consultant.

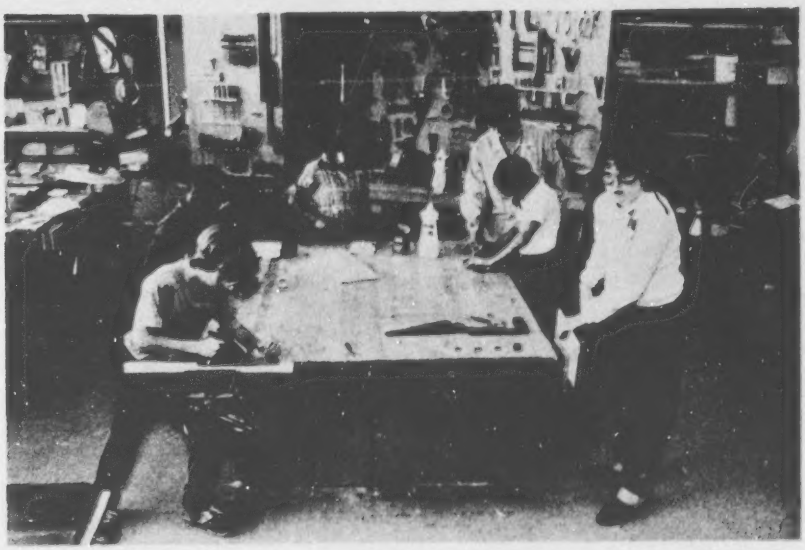
- The classroom teacher has the option for deciding the most suitable time to present the ESIA lesson; reducing the need to preschedule another site.
- Team teaching is encouraged through the cooperative efforts of the classroom teacher and the industrial arts consultant.

The self-contained classroom can be arranged in various ways for presenting ESIA activities.[1] For example, to form the needed work stations, students' desks or large auxiliary tables can be pushed together and covered with thin plywood sheets to protect the surfaces. Some school districts may decide to use small sawhorses and plywood sheets to provide working areas for their students. Common hand tools can be placed in a portable cart or cardboard box and moved from one classroom to another as needs dictate. Equipment and facilities that are movable can serve many classrooms rather than one.

[1]See Johnson, Hiram and others. The Learning Center Ideabook (Allyn and Bacon, Inc., 1978). It stresses why problem solving, or what the authors describe as "productive behavior," is better than mimicry or "reproductive behavior." In this approach, the need for learning centers within the self-contained classroom is most apparent. Since these learning centers are organized around topics or content areas, it seems natural to include one area for industrial arts. This reference goes to great lengths to describe the basic philosophy of the use of learning centers, and contains many well-illustrated activities.

The Separate Laboratory Facility

Where physically feasible, a separate laboratory facility may be furnished to benefit the entire school. Rather than providing tools for each classroom, one complete set is available to all who use this facility. If the area is planned for industrial arts activities exclusively, work tables can be permanently installed. In this situation, the industrial arts consultant who coordinates activities at the facility and the classroom teachers should work together to determine schedules that most effectively meet students' needs.

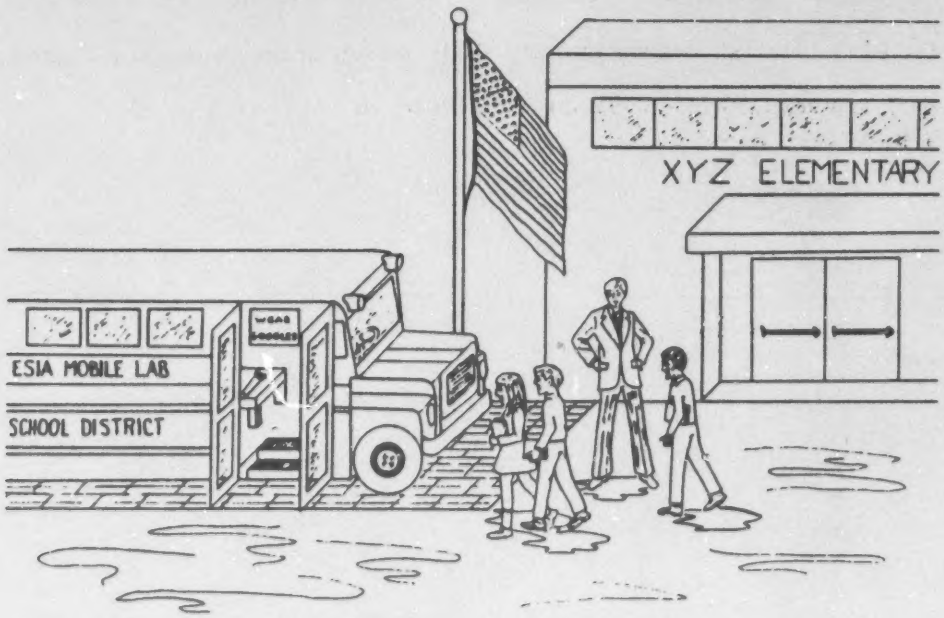


There are various advantages for using this approach. The isolated location of an ESIA laboratory reduces the noise problem in regards to other areas of the school. Time is not lost in the preparation of the work area, and dust and fumes from the industrial arts activities are concentrated in one room. Also, storage of materials, tools, equipment and projects are also centralized. While this area can provide a comfortable work atmosphere for students, it can also be used by teachers who are preparing materials for industrial arts activities in the self-contained classroom. When furnishing a separate laboratory facility, it is recommended that a certified industrial arts teacher act as a consultant to coordinate activities in this facility.

The Mobile Laboratory

A school district with two or more elementary buildings may benefit from the services of a mobile laboratory, which could be either a van or trailer-type vehicle. With this approach, many children can be served at minimal cost.

The laboratory should be maintained by an industrial arts consultant, and should contain tools and materials designated for each day's lessons. All other tools and materials could be stored in a central facility when not in use.



ESIA Activities by Grade Levels

What Can Students Accomplish?

ESIA Activities By Grade Levels: What Can Students Accomplish?

A child's physical, intellectual, emotional and social development is a continuous process, and differs for each child. However, certain identified phases of development provide guidelines for determining appropriate industrial arts activities at various grade levels. When planning objectives for ESIA activities, it's necessary to be familiar with child development and capabilities of children at each grade level.

One resource which can assist in planning appropriate activities and objectives is a monograph titled The Developmental Growth of Elementary School Students and the Role of Industrial Arts in the Process.[1] This resource explains growth and development of children ages three to 13, descriptions of physical characteristics, emotional traits, motor and intellectual development, and observable behaviors. The developmental characteristics are summarized on the next three pages.[2]

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[1]See Rosser, Arthur. The Developmental Growth of Elementary School Students and the Role of Industrial Arts in the Process (American Council for Elementary School Industrial Arts, Monograph 5, 1978). It includes industrial arts activities which are appropriate to each developmental stage. Write to AIAA, 1914 Association Drive, Reston, Virginia 22091.

[2]Ibid., pp. 33-35.

DEVELOPMENTAL CHARACTERISTICS				Characteristics of Appropriate Technological Activities
Age	Physical	Emotional/Social	Motor and Intellectual	
3	Very rapid growth Self Sufficient in eating Disposition indicates need for rest Toilet trained	Cooperative, happy Can share and take turn Peaceful with peers Needs attention and praise Imaginary friends Can be reasoned with	Can alternate feet going upstairs Rides three wheeled toys Spills at meal time are less frequent Throws overhead with body Able to draw recognizable shapes Can stand on one foot	Creative products as desired by children Sawing, nailing, drilling, and gluing are desirable activities Red clay with pincy pot and slab work Activities should stress large muscle development Jigs and fixtures will be needed to help guide tools e.g. miter box, drilling guide Materials such as corrugated cardboard, foamed plastic sheet, and thin, narrow strips of wood should be on hand Odd shaped, small piece of scrap lumber may be used for wood sculpture A large log, railroad tie, or fence post provides an excellent place for driving 4d or smaller common nails
4	Very energetic Can run, turn, and stop without falling Dramatic play Improved dexterity Reality-oriented Large muscle use predominate	Begins bossing, arguing, boasting and even fighting Home oriented Will become engrossed in individual activity Interest in sexual differences	Preoperational thinker No longer need to give full attention to common motor activities More thinking about what is being done—less about how-to-do-it	
5	Reduced rate of growth Legs lengthen in greater proportion Large muscles developing faster than small	Ready to engage in quiet activity Likes to be creative in constructing things to take home	Activities involving fine or close work should be avoided Enjoy block and plank construction Able to visualize things	
6	Growth rate reduced Body type becomes evident Hand-eye coordination continue to improve Large muscle skill more smoothly executed Fine motor skills need refinement Handedness established	May become stubborn, quarrelsome, and selfish More compatible with parent of opposite sex May identify with adults Likely to become dependent Can play in organized team	Motor interest tend to be the same as 5 year olds. They are executed with more skill Increased attention span and ability to concentrate Differentiate between reality and fantasy Great curiosity	

*Reprinted with permission from the American Council for Elementary School Industrial Arts

Age	Physical	Emotional/Social	Motor and Intellectual	Technological Activities
7	One of the most active periods in the childs development Becomes absorbed in games which involve running, jumping, chasing, or dodging Like wheel toys	Like small group play Behavior alternates between extremes of good and bad High regard for the opinion of teachers	Vocabulary is important to 7 year olds Their's contains about 2500 words Knows money Knows name of parents and address Begins reading	Use of small size regular tools become easier Products can be preplanned Jigs and fixtures are necessary to provide the desired accuracy Simple group projects can be useful Technological activities can be related to academic subjects to provide concrete experiences which are meaningful to this age child Cost of materials and the time required to do the work can be considered Some children will begin to develop hobby interest which will overlap school activities
8	Show regular growth Nervous habits may develop Hop scotch and jumping rope are popular	Begins to be influenced by peers Choice of friends not influenced by economics	Not able to construct things as well as desired Can tell time Understands basic math	
9	Fine motor development evident Writing improves Enjoys bicycling, swimming and skating	Signs of modesty Not good group member Respect property rights Behavior often better away from home	Able to handle multiplication and division Reduced interest in fantasy Special interest begin to replace totally play activities	
10	Slowed in growth Begins to be concerned about physical appearance Active Likes all types of play Adventuresome	Antagonism develops between the sexes Many students begin lifetime hobbies Works well in groups Eager to learn new skills and work with adults	Thinking in the concrete operational stage Begins to show interest in the past Can handle money May become a perfectionist Interested intools, skills, occupations, and products of the real world	

Age	Physical	Emotional/Social	Motor and Intellectual	Characteristics of Appropriate Technological Activities
11	Girls show rapid increase in weight and maturity Boys more active Both willing to work to learn new skills	Will play games as team member Privacy becomes an issue	Begins to plan ahead Interested in thoughts of others Enjoys gathering facts and presenting a case	Fine motor skills can be used effectively Strength much less a factor in choosing tools and materials Students will be more interested in planning activities They will be more responsible in obtaining materials, tools, and supplies Technological activities could relate to other areas of the curriculum
12	Many girls no longer equal to boys in strength Most children begin to exhibit individual preference for games and motor skills	Club memberships take on new meaning Team games become important	Critical of their own efforts Interested in earning money	
13	Less involved with games which require whole body activities Some children are awkward Most girls are aware of their developing figures	Social contacts widening Will want some privacy	Ability to reason sharpens Can deal with abstract ideas Can control emotional outburst Difficult age for parents and teachers	

Another source to refer to in planning appropriate activities and objectives for various grade levels is a publication titled Early Childhood Guidelines in Pennsylvania.[3] Although it is designed for use in primary grades, it can be used for educational experiences in grades K-6, including industrial arts activities. An example of this approach to planning industrial arts activities is included in the sample lesson plan of this guide; identified in the lesson plan as "Application and Acquisition of Skills."

Identifying commonalities or "points of contact" between an educational activity, and the acquisition of skills and competencies is important when planning an ESIA activity.[4] For example, a child who reads, writes and publishes a report on a completed ESIA activity could benefit in categories such as gross motor training, fine motor training, language activities, perceptual activities and social studies education. The next page offers an example of how this activity correlates, at the very minimum, with a few categories identified in Early Childhood Guidelines in Pennsylvania.

[3] Early Childhood Guidelines in Pennsylvania (Bureau of Curriculum Services, Pennsylvania Department of Education) is reprinted in its entirety in the following pages.

[4] For additional assistance in planning ESIA activities, request two resources titled "Developmental Characteristics of Young Children, Ages 4, 5 and 6" and "Developmental Characteristics of Children, Ages 6 to 9" from Jessie Sanders, Early Childhoold Education Advisor, PA Department of Education, 333 Market Street, Harrisburg, PA 17108.

Gross Motor Training

Walking

Fine Motor Training

Folding
Pasting
Printing
Punching holes
Sorting
Writing

Language Activities

Deciding
Explaining
Giving Directions
Listening
Noting relationships
Reporting

Social Studies Education

Appreciating workers
Communicating effectively
Understanding role of self
Valuing self

The early childhood program in Pennsylvania shall give major emphasis to the development of a healthy child, one whose physical, social and emotional well-being is such that intellectual growth is possible.

This necessitates maintaining or improving the mental and physical health of the child through a specific program of dental, psychological, social and physical services. Accordingly, each program shall assure that all young children are fully immunized before admission to public school.

Furthermore, each child who has needs in any of these areas shall receive treatment or care through a physician or dentist chosen and reimbursed by the parent whenever possible or through contracted services when needed.

Each program shall provide experiences appropriate to the developmental levels of each child. These experiences, both informal and planned, shall include:

FREE PLAY

A minimum of thirty minutes free indoor activity and a minimum of fifteen minutes outdoor activity daily.

GROSS MOTOR TRAINING

- .balancing
- .bending
- .body localization
- .bouncing
- .calisthenics
- .catching
- .daily indoor play
- .daily outdoor play
- .dancing
- .free body movements
- .galloping
- .hammering
- .hitting
- .hopping
- .jumping
- .lifting
- .pulling
- .pushing
- .rhythmic movements
- .rolling
- .running
- .sawing
- .shaking
- .skipping
- .sliding
- .throwing
- .turning
- .twisting
- .walking

FINE MOTOR TRAINING

- .bending wire
- .blackboard activities
- .buttoning
- .clapping
- .crumbling
- .cutting
- .drawing
- .etching
- .eye exercises
- .fingerplays
- .folding
- .foot and toe exercises
- .lacing
- .modeling with clay
- .painting
- .pasting
- .printing
- .punching holes
- .sorting
- .squeezing sponges
- .tapping
- .tearing
- .tracing
- .tying
- .using puzzles
- .writing
- .zipping

LANGUAGE ACTIVITIES

- .choral speaking
- .conversing
- .creating experience stories
- .deciding
- .discussing
- .dramatizing
- .explaining
- .giving directions
- .imagining
- .labeling
- .laughing
- .listening
- .listening to poetry & stories
- .mimicking
- .naming objects
- .noting relationships
- .picture reading
- .playing vocabulary games
- .reacting
- .reporting
- .rhyming
- .roleplaying
- .selecting
- .selecting main idea
- .sequencing objects
- .sharing information
- .singing
- .story telling
- .understanding symbols
- .using puppets

PERCEPTUAL ACTIVITIES

Related to:

- .associating
- .auditory perception
- .classifying
- .comparing
- .coordinating
- .discriminating
- .equalizing
- .identifying
- .kinesthetic perception
- .laterality
- .motor perception
- .noting relationships
- .olfactory perception
- .organizing
- .reproducing
- .sequencing
- .seriating
- .space orientation
- .tone differentiation
- .tone matching
- .visual perception

MATHEMATICAL ACTIVITIES

Involving:

- .counting
- .distance
- .estimating
- .form
- .grouping
- .height
- .mathematical vocabulary
- .mental computation
- .money
- .number
- .numerals
- .ordinals
- .place
- .quantity
- .relationships
- .sets, subsets
- .size
- .shape
- .speed
- .temperature
- .time
- .use of mathematics in daily life

SCIENCE ACTIVITIES

Including:

- .associating
- .collecting
- .comparing
- .differentiating
- .discovering
- .experimenting
- .exploring
- .hatching
- .mixing
- .observing
- .planting
- .problem solving
- .questioning
- .reporting

With such subjects as:

- .air
- .balance
- .birds
- .caterpillars
- .chicks
- .cloth
- .conservation
- .eggs
- .electricity
- .flowers
- .frogs
- .heat
- .insects
- .leaves
- .light
- .liquid
- .machines
- .motion
- .mud
- .rocks
- .safety
- .sand
- .sanitation
- .seeds
- .shadows
- .snakes
- .soil
- .solids
- .space
- .squirrels
- .toys
- .turtles
- .vegetables
- .water
- .any other subject of interest

INDUSTRIAL ARTS ACTIVITIES

Involving:

- .appreciating world of work
- .constructing individually or cooperatively
- .discovering materials
- .discovering power activities
- .improving gross and fine motor skills
- .manipulating tools
- .respecting tools and materials
- .understanding interdependence of people and machines

FINE ARTS ACTIVITIES

In Music:

.calisthenics
.clapping
.counting to music
.creating music
.dancing
.exploring pitch, tone, intensity
.folk dances
.free movement
.humming
.listening for appreciation
.making instruments
.mimetics
.musical games
.rythm band
.running
.singing
.skipping
.viewing filmstrips with records

In Art:

.appreciating
.building
.creating with many raw materials
.cutting
.drawing
.experimenting
.exploring multi-sensory materials
.mixing
.molding
.painting
.pasting
.reacting to films, filmstrips
.tearing

INTERGROUP EDUCATION

Related to:

.PERCEIVING differences and similarities
.UNDERSTANDING differences and similarities
.VALUING differences and similarities

.cultural
.economic
.ethnic
.human
.racial

SOCIAL STUDIES EDUCATION

Related to:

.appreciating workers
.communicating effectively
.developing positive attitudes toward people and things
.discovering travel and transportation
.enjoying holidays and heroes
.improving personal work habits and exploring simple economics
.learning about families and family structure
.learning respect for law and order
.making friends
.understanding role of self
.valuing self

Suggested Industrial Arts Activities By Grade Levels

When planning objectives for areas of instruction, teachers and industrial arts consultants will structure identified content, as well as the evaluation of outcomes of the activity. At the local school level, specific objectives for language arts, computer applications, mathematics, natural and social sciences may exist. The planned ESIA activities should be developed to motivate, enrich, correlate, integrate and provide opportunities for the application of understandings within these basic subject areas.[5] To assist in this development, the following list provides a few ideas.

KINDERGARTEN

A. Math

Sorting wooden blocks or dowel rods according to length or size.
Using a child size store with a cash register and play money.
Matching pieces of wood to a given number.
Classifying materials such as sorting sandpaper, wood and nails.
Using a number board.
Making a cardboard or styrofoam sculpture.
Counting to music.

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[5]See Flanagan, John C. and others. Behavioral Objectives: A Guide to Individualizing Learning (four volumes, Westinghouse Learning Press, Palo Alto, CA, 1971), contains approximately 4,000 instructional objectives in the areas of language arts, mathematics, science and social science. These volumes represent the efforts of over 100 teachers and an almost equal number of staff members at the American Institute and Westinghouse Learning Corporation.

B. Reading and language arts

Making alphabet books.
Moving and making simple hand puppets for people or animals.
Creating music with rhythm instruments and dancing.
Making masks.
Making animals from various sizes of cardboard or chipboard boxes.
Helping make gingerbread men and women or "storybook character cookies".
Using floor models to encourage child's pretending tendency.

C. Science

Discovering different kinds of seeds and materials needed while planting them.
Forming clay animals.
Forming fruits and vegetables from papier mache.

D. Social Studies

Cutting and making a tepee.
Creating gifts for special days from paper, cardboard, wood or clay.
Drawing paper bag zoo animals from oaktag.
Playing with a child's store and pretending to be workers in the store.
Using a playhouse and pretending to be a family and friends.
Manipulating and building small kinds of transportation such as a boat, train, airplane, horse or truck.
Decorating paper, cards and gifts.
Forming handprints in clay and plaster.

FIRST GRADE

A. Math

Making large size dominos.
Playing an arithmetic game.
Using a simple desk abacus.
Placing movable parts in a calendar correctly.
Using a number chart.

B. Reading and language arts

Drawing and constructing dioramas for classroom stories.
Constructing a puppet stage from a large box.
Making a simple "TV" screen from cardboard box.
Using microphones and telephones in communication with friends.

C. Science

Experimenting with leaf imprints.
Preparing fruits in season such as applesauce.
Manipulating movable parts of a weather chart.
Planting seeds and making container for growth.

D. Social Studies

Making hats or other garments that symbolize school helpers such as school patrol officers, traffic and police officers, and fire fighters -- role play the various ways they help the school.
Naming articles made from wood used in the home.
Naming and collecting articles made from wood used in school.
Decorating articles for home - print with blotters or inner tubes.
Pretending and experiencing work of community helpers using solid materials.
Manipulating wooden pieces of cut-out map - Puerto Rico or Hawaii.

SECOND GRADE

A. Math

Manipulating hands and telling time using movable hands on a clock.
Counting and selling fruits and vegetables for use in a classroom store.
Measuring liquids and food.
Jumping and twisting to play a floor game - addition and subtraction.
Comparing numbers for greater or less than.

B. Reading and language arts

Drawing and making notebook covers.
Creating hand and stick puppets from everyday materials.
Constructing a movie box.
Creating cloth stuffed figures to represent story characters.
Drawing and cutting bookmarks.
Making a diorama of a story using shoeboxes and construction paper.

C. Science

Forming and creating clay seasonable fruits and vegetables.
Draw, cut and paste a simple diorama of a bird and nest habits.
Collecting, pressing and mounting leaves.
Building a classroom seed box from wood.

D. Social Studies

Constructing from wood a school, firehouse, store or a home.
Making useable articles for classroom - games or bookends.
Experimenting with clay in making animals, figures, plaques or dishes.
Making a map of the neighborhood.
Helping to construct models of a post office.
Collecting models of farm transportation and pretending to be helpers.

THIRD GRADE

A. Math

Cutting individual rulers and measuring inch and half inches.
Constructing an abacus from wood and dowel rods.
Making counters for abacus from salt flour dough.
Build a play store from a large box.
Count and make change using play and real money.
Cutting geometric shapes from wood.
Grouping objects into sets and subsets.
Cut out and place numerals on clocks from 12" squares of wood and popsicle sticks.

B. Reading and language arts

Experimenting with story-book covers.
Constructing a puppet stage from a large box.
Making mobiles with story booklets.
Creating stocking and jointed stick puppets.
Building a model TV studio from large boxes.

C. Science

Build a birdhouse and birdfeeder.
Constructing a weathervane.
Creating dioramas showing habitats of animals.
Constructing a terrarium.
Experimenting with common materials such as used lightbulbs and disposable bottles for ecology.

D. Social Studies

Experimenting with a combination of materials to build a model airport and planes for transportation.
Using salt-flour dough to make a map of the Hawaiian Islands.
Building a scale model of San Francisco Harbor.
Using a variety of materials to build a miniature community showing residential and industrial areas.
Making models of things used in pioneer times.
Create a diorama of modern day times with electric appliances.
Using wood, building furniture for pioneer and modern homes.

FOURTH GRADE

A. Math

Construct a balance scale.
Cutting and measuring fractional parts of squares, rectangles, circles and triangles.
Measuring ingredients for baking such as 1/2, 1/3, 1/4 of a cup.

B. Reading and language arts

Building props for a play.
Constructing and using puppets on a puppet stage.
Making wall hangings.
Creating plays from given stories.
Dramatizing plays using scenery made by committees.

C. Science

Collecting and assembling materials depicting the natural habitat of plants.
Comparing and making dioramas of the four seasons.
Collecting specimens and constructing boxes for them.
Observing soil erosion from a model.

D. Social Studies

Building models of colonial furnishings.
Constructing a panorama of an Indian village and trading post.
Making papier mache globe with continents.
Weaving and making pottery for Indian crafts.
Sewing a sampler and making a wooden frame.
Constructing dioramas of life in hot and cold lands.
Comparing rainfall on a rainfall map made by a committee.

FIFTH AND SIXTH GRADES

A. Science

Building model rockets from a kit.
Building simple machines and the students' actual use of a pulley, wedge and screw.
Constructing a solar hotdog cooker-reflector type.
Experimenting with models of windmills.
Constructing solar collectors using the greenhouse effect and testing different colors of collector plates.
Breadboarding a miniature computer.

Making posters of alternate sources of energy-geothermal, nuclear, solar cells, wind energy or the bioconversion process.
Operating small airplane engines.
Making models of airplanes.
Building and racing CO_2 racing cars.
Building sailboats to demonstrate wind power.
Constructing kites and kite winders.
Maintaining parts of a bicycle and studying how they work.
Constructing a tin can lamp while emphasizing how to wire a socket.

B. Math

Solving problems of gear ratios, chain and socket, belts and pulleys.
With ruler, measuring of materials used in making projects.
Using graph paper to enlarge and reduce drawings.
Measuring electrical pressure using a meter and Ohms Law.

C. Social Studies

Constructing igloos from sugar cubes and styrofoam balls.
Making styrofoam silhouettes of Presidents using hot wire cutters.
Covering high points of the most important inventions over a period of one hundred years while using a time line. An example would be the steam engine.

D. Reading and language arts

Using a word processor and offset or spirit duplicator to print pamphlets or newsletters.

Teacher Development

Professional Assistance for the Teacher

Teacher Development: Professional Assistance for the Teacher

In order to successfully correlate industrial arts activities with the elementary school curriculum, teacher development is vital. Special preparation for classroom teachers or industrial arts teachers who will be organizing and directing industrial arts activities may be accomplished through a self study, and trial and error procedure. The most common procedure, however, is through participation in a series of courses or workshops.

In general, the objectives of teacher development are to heighten and broaden their skills for coordinating an effective industrial arts program.[1] More specifically, it will be necessary to develop or reinforce teachers' understandings of industrial arts and technology, of the learning characteristics of young children, of the interrelationships of content within the elementary school curriculum, of progressive teaching techniques often used in grades K-6, and of fundamental skills and knowledge regarding the use of tools and materials.

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[1] A basic text for use by industrial arts consultants and classroom teachers, which describes the role of ESIA, methods and materials of construction, the use of correlated activities, and the tools and equipment needed, is Teaching Elementary Industrial Arts by W. R. Miller and Gardner Boyd (Goodheart-Wilcox, Co., Inc., 1970). The authors support the use of correlated activities within the curriculum as a practical approach to an already overcrowded teaching schedule .

Classroom and industrial arts teachers have an excellent opportunity for building bridges of support and understanding. When they plan and team teach units of instruction, they draw upon the professional strengths of each other.

Preparing The Industrial Arts Teacher and the Classroom Teacher

Industrial arts teachers who will be organizing or directing an ESIA program need to strengthen their understandings of the growing rates of young children and of the interrelationships of various subject areas within the K-6 curriculum. Learning how to adapt industrial arts activities to the small hands and probing minds of elementary school students requires special considerations and knowledge.[2] Using "watered-down" activities or projects designed for adolescents and young adults can create more problems than rewards.

Elementary teachers who will be implementing an ESIA program need to understand the impact of a lesson on the children, as well as to gain self-confidence in this new approach to teaching. Because the educational training of elementary teachers is quite different from the training of industrial arts instructors, elementary teachers need assistance in gaining basic understandings of technology and how it affects our daily lives. They also need special assistance in learning how to conduct ESIA activities to support their on-going programs of mathematics, language arts, the sciences and fine arts.

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[2]An excellent publication concerning values, methods and programs for ESIA is Elementary School Industrial Arts (AIAA "Focus" series, 1971), which offers a good introduction for teachers, administrators and parents. Write to American Industrial Arts Association, 1914 Association Drive, Reston, VA 22091. Also available from the AIAA is a collection of articles written by teacher educators on their ideas of personnel development, and the classroom and the activities; request Establishing An Industrial Arts Program (1980), edited by Michael R. White.

Teacher development in these areas are offered through courses at institutions of higher learning, and inservice workshops sponsored by either local school districts or intermediate units. In addition to educational training, it is important for participants to practice on-the-job experiences of preparing, teaching and evaluating selected ESIA activities. Below are several suggestions for industrial arts consultants and elementary teachers.

- Visit ESIA programs in Pennsylvania and other states. For additional information, contact the Adviser for Industrial Arts, Bureau of Vocational Education, Pennsylvania Department of Education, P.O. Box 911, Harrisburg, PA 17108.
- Become aware of current philosophies and values in ESIA by conducting a thorough search of available written materials, tape-slide series and 16mm films.[3]

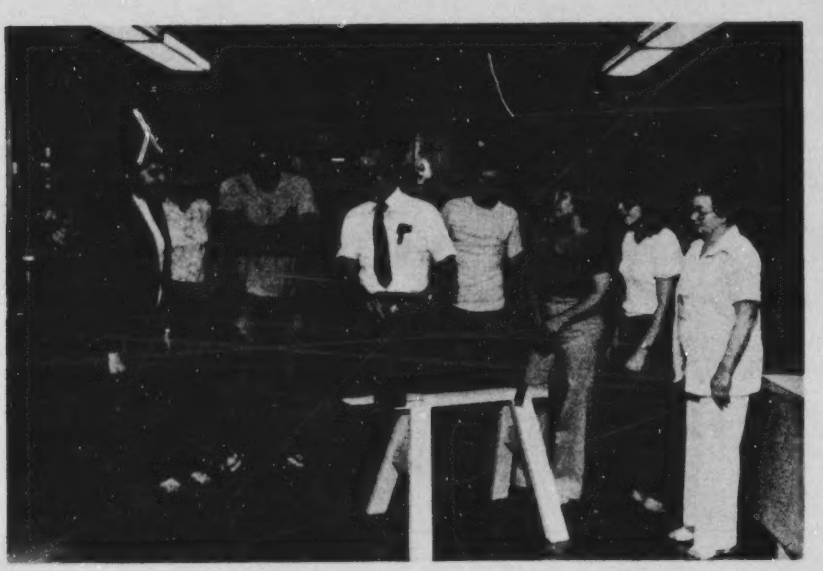
[3]Films about ESIA activities are available for purchase or loan from the Los Angeles Unified School District (632 Madison Avenue, Los Angeles, CA 90004). A partial listing includes: Converting the Elementary Classroom into an Industrial Arts Lab, How to Initiate Construction in the Elementary School, A City for Learning, and How to Start Leatherwork in the Elementary School Classroom.

Other excellent audiovisual resources are two slide-tape presentations which can introduce parents or teachers to the philosophies of an ESIA program. "Philosophies and Values of ESIA" and "Career Awareness. Model Incorporating Constructional Activities, K-6" are available at minimal cost from Dr. F. Milton Miller, Industrial Education Building, University of Missouri - Columbia, Columbia, Missouri 65211.

Also available is a directory of resources concerning teacher development, innovative programs, career education, and other phases of ESIA. Directory of Resource People, compiled by Michael R. White, is available at minimal cost from the AIAA, 1914 Association Drive, Reston, VA 22091.

- Consider enrollment in additional college-level courses. Contact the Department Chairperson for Industrial Arts Education at any or all of these institutions:

  - California State College, California, PA 15149
  - Cheyney State College, Cheyney, PA 19319
  - Millersville State College, Millersville, PA 17551
  - Temple University, Philadelphia, PA 19122



College courses and inservice workshops offer teachers the opportunity to learn how to use tools and materials creatively while supporting basic educational programs.

- Become professionally involved with ESIA on the state and national levels. This can be initiated by joining the Industrial Arts Association of Pennsylvania and the American Council for Elementary School Industrial Arts.[4] While both of these organizations are affiliated with the American Industrial Arts Association (AIAA) membership in the AIAA is not required.[5] Classroom teachers are also encouraged to join these professional organizations.

[4]The writing committee of this guide encourages active membership in three organizations which support the use of ESIA activities. See pages 114 and 116 for sample letters to obtain information about these organizations.

[5]A good reference for identifying current practices and trends in ESIA programs is the annual publication of the proceedings of the AIAA's annual conference. It also contains addresses and proceedings of the American Council for Elementary School Industrial Arts (ACESIA). Write to AIAA, 1914 Association Drive, Reston, VA 22091.

The Role of the Industrial Arts Teacher

There are various ways an industrial arts teacher can be involved with an ESIA program. An experienced industrial arts teacher can function on a part-time basis by setting aside a portion of the school day to prepare and teach units of instruction with the aid of one or two classroom teachers. An industrial arts teacher without previous experiences in using tools and materials in grades K-6 can function on a gradual approach. Then as the program advances on its own merits, and involves more classroom teachers, one possible option could be the employment of this same industrial arts teacher as a full-time industrial arts consultant.

Responsibilities of full-time or part-time industrial arts teachers would include:

- Working with the elementary classroom teacher and members of supportive staffs to establish industrial arts as an integral part of the curriculum.
- Coordinating the efforts of the teachers and administrators to improve instruction and enrich the curriculum with industrial arts experiences.
- Making available materials, tools, audio visual media and any other instructional aids necessary for the successful completion of the planned activities.
- Assisting the classroom teacher, when requested to do so, with the instructional activities planned.
- Providing a program of inservice education for elementary school teachers.
- Working to improve understanding of elementary school industrial arts.
- Supporting an on-going program of subjective and objective evaluation.

remove and mail

_____
(date)

Mrs. Nancy L. Andre
555 Old National Pike
Brownsville, Pennsylvania 15417

Dear Mrs. Andre:

Please send me descriptive information concerning membership in the Industrial Arts Association of Pennsylvania.

My name and address are:

_____
(print)
_____
_____
_____
(zip)

Sincerely,

remove and mail

_____
(date)

Dr. John H. Lucy
Industrial Arts and Technology Department
California State College
California, Pennsylvania 15419

Dear Dr. Lucy:

As a practicing professional in the field, I wish to expand my knowledge and involvement in regards to elementary school industrial arts. Please send me descriptive information and membership forms for these two organizations.

1. The American Industrial Arts Association
2. The American Council for Elementary School Industrial Arts

My name and address are:

_____
(print)
_____
_____
_____
(zip)

Sincerely,

Funding

How Do We Pay for ESIA?

Funding: How Do We Pay For ESIA?

An essential part of the initial stages of designing an ESIA program is obtaining funds for inservice training of teachers, tools, materials, equipment and teachers' salaries. After options are explored and sources are identified, another important consideration is the restrictions on the use of those funds. Each funding source may have unique restrictions that could interfere with local control. For example, if an ESIA program is funded by the Career Education Incentive Act or the Curriculum Materials Program of the U.S. Department of Energy, the local school is required to integrate specific objectives into daily lesson plans. Although federal funding sources can assist in starting an ESIA program, the use of state and local monies to support an ongoing ESIA program will be advantageous.

Many existing ESIA programs began with funds obtained from businesses and industries, while administrators sought funds from federal, state or private agencies. Although most funding agencies do not specifically cite ESIA programs as a criterion for funding, these funding agencies have provisions for monies to support the types of activities that industrial arts can provide within grades K-6. Thus, the pursuit of funds is also a pursuit of information.

A thorough review of federal, state, local and private agencies which provide grants or funds is necessary. Additionally, finding contact persons who administer or advise others on obtaining funds is also necessary. For example, appropriate persons to contact at the Pennsylvania Department of Education (PDE) would be those who are involved with administering funds for elementary and secondary education programs, disadvantaged children, vocational education, curriculum development, and gifted and talented students. If an ESIA program will be integrated with an ongoing curriculum as part of career awareness, contacts with personnel at the PDE who are knowledgeable about career education funding would be beneficial.

Also, state and U.S. lawmakers may be able to provide information or names of contact persons for obtaining funds. If the purchase of tools and materials presents problems, contacts with local business persons and industries may be beneficial.

In summary, the gathering of information, and a thorough examination of funding guidelines are necessary in obtaining funds.

Competitive Funding

The formal procedure for obtaining funds is the submission of a project proposal. This is a written document that follows certain guidelines. In general, it should describe in a concise manner the objectives, activities, evaluation methods and cost of the proposed project. Although guidelines for the format of proposals submitted to various funding agencies may differ, there are certain steps germane to the proposal writing process.[1] It may also be helpful to find out which proposals have been accepted and funded by a funding agency in order to determine the format and key ideas to be included in the proposal. The following page describes a general format for this task.

More often than not, competitive funds are obtained on the basis of the relationship developed between the applicant and the funding agency rather than solely on the basis of the applicant's proposal describing the project's content. Therefore, informal and formal communications between the funding agency and the applicant are of paramount importance. Additionally, repeated contact with someone from the funding agency is beneficial.

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[1]Kuitz, N. J. "Program Planning and Proposal Writing," The Grantmanship Center News, 1975.

Abstract-- a narrative report, summarizing the problem, objectives, evaluation methods and budget for your project, should be submitted first.

The Formal Proposal

A. State the problem - give a brief statement of the needs that are not fulfilled by the existing curriculum. Explain the importance to address these needs and explain how it relates to innovative elementary education or national concerns.

B. Objectives - state objectives to be achieved in your proposed project. They should be clear and capable of being attained by the proposed procedures.

C. Procedures - describe in detail the procedures for conducting the project. When appropriate, provide specific information about:

- project design
- population
- data to be gathered
- procedures for examining and evaluating data
- a time schedule

D. Budget - provide a breakdown of equipment, supplies and staff expenses.

Tools and Materials

What Do We Need to Get Started?

Tools and Materials: What Do We Need to Get Started?

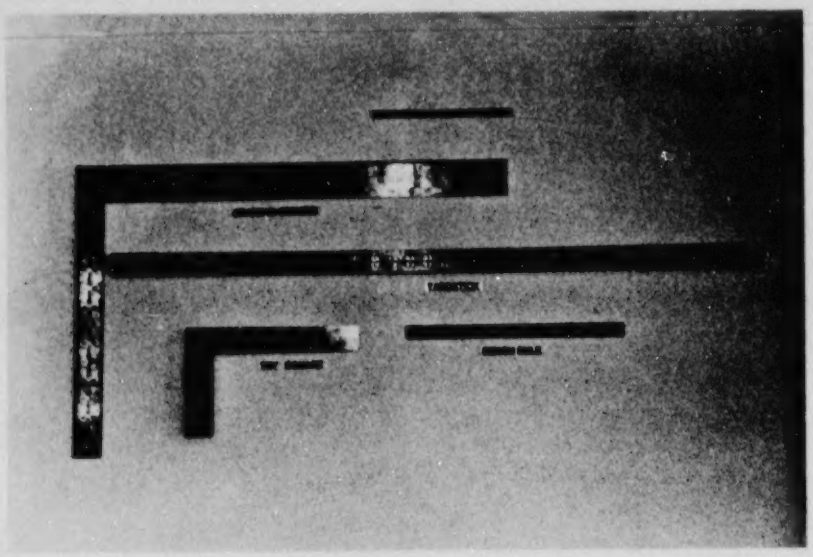
Various tools and materials are needed to conduct a successful ESIA program. Each school district should consider tools, equipment, and materials to include on a list of basic needs.

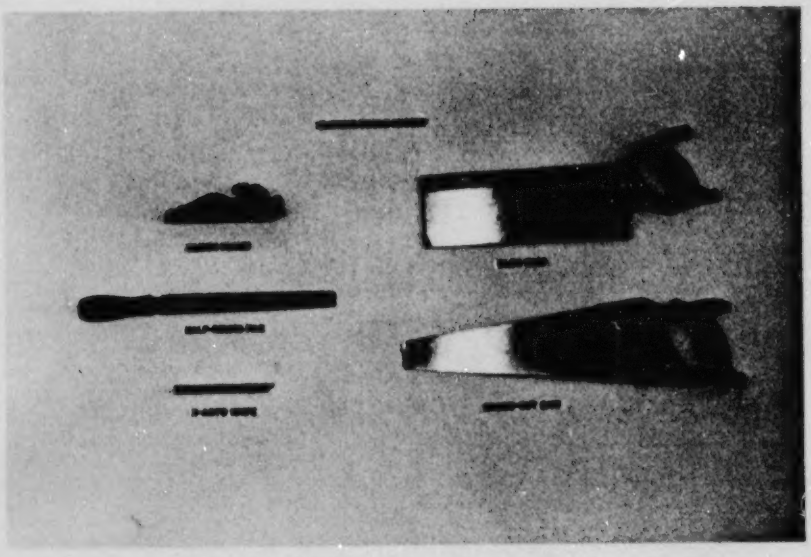
In selecting equipment, concern should be given to the physical development of the students. Teachers who use "hand-me-downs" from home or high school industrial arts programs soon discover the tools and materials create more problems than they solve. For example, a primary-level student cannot be expected to cut a piece of hard wood with an adult-size crosscut saw while the wood is held in a vise on a 32" high workbench. Instead, this activity requires the use of a coping saw, a soft piece of wood, and a 20" high workbench.

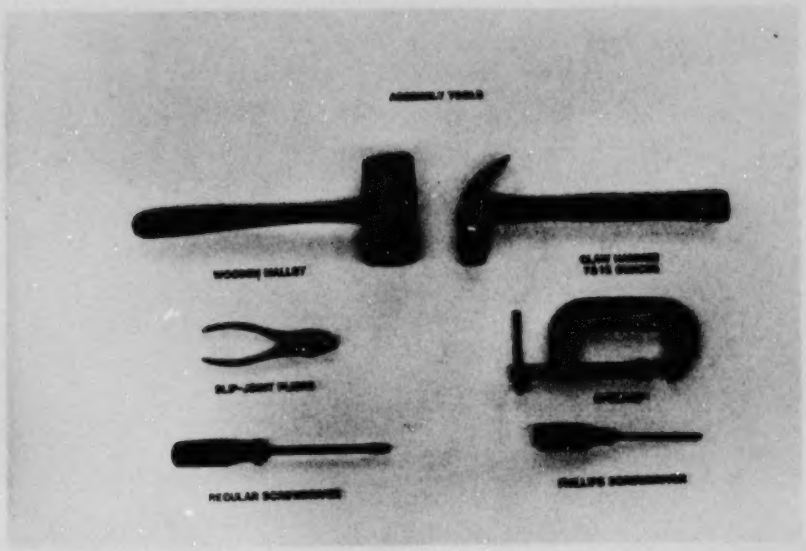
F. Milton Miller and James E. O'Bannon, teacher educators from the University of Missouri-Columbia, developed a career awareness model incorporating constructional activities for grades K-6.[1] Part of this extensive study involved a survey of frequently used tools at twenty ESIA programs throughout the country. Their findings identified tools in five general areas, which are illustrated on the following pages.

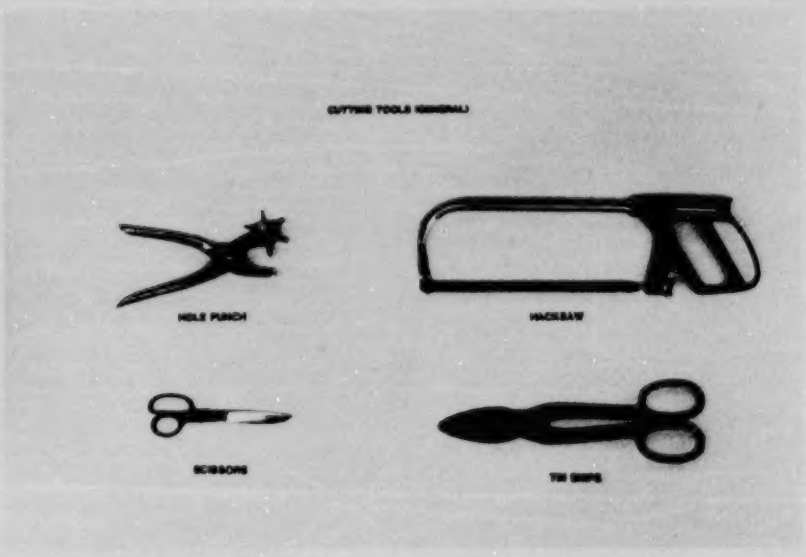
- Measuring and layout
- Cutting tools-wood
- General cutting tools
- Drilling and boring tools
- Assembly tools

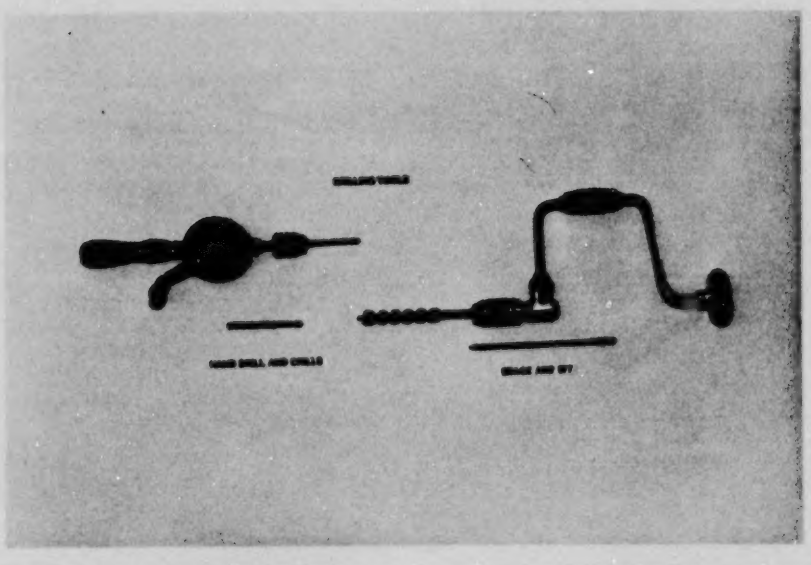
[1]Miller, F. Milton and James E. O'Bannon. A Career Awareness Model Incorporating Constructional Activities in Grades K-6 (Research Coordinating Unit, Missouri Department of Education, 1975).








HOLE PUNCH
HACKSAW
SCISSORS



A list of tools and materials has been prepared by the writing committee for this guide. This list may be modified according to the needs of the local ESIA program, differences in local curriculum goals, the number of students involved, and the number of industrial arts activities to be conducted throughout the school year. The following list is based on suggestions from experienced classroom teachers and industrial arts consultants involved in ESIA programs.

LAYOUT TOOLS

- Try square
- Combination square
- Framing square
- Steel rule
- Measuring tape
- Dividers
- Compass

WOODWORKING TOOLS AND MATERIALS*

- Handsaw-crosscut
- Handsaw-rip
- Coping saw and extra blades
- Keyhole saw
- Block plane
- Smooth plane
- Spoke shave
- Round surform
- Half-round surform
- Flat surform
- Wood chisels, 1/4", 1/2", and 3/4" wide
- Wood files, assorted
- High speed drill bits, 1/8" to 1/2" by 16th's
- Auger bits, 1/4" to 1" by 16th's
- Diagonal cutting pliers
- Rosebud countersink
- Speedbores, 3/8" to 1 1/4" by 8th's
- Handdrill, 3/8" capacity
- Bit brace
- Carving tool set
- Utility knife
- Cabinet scraper
- Sharpening stone
- Claw hammer, 7 oz., 13 oz.
- Tack hammer
- Wooden mallet
- Nail set
- Clamps, spring, parallel, strap, and bar
- Nails, 2d, 4d, 6d, 8d common 2d, 4d, 6d, 8d box 2d, 4d, 6d, 8d finishing
- Wire nails, 1/2", 3/4", 1" long
- Wire brads, 1/2", 3/4", 1" long
- Wood screws, assorted
- Glues, liquid resin, plastic resin, rubber cement, acrylic plastic cement, hot melt glue gun, and glue sticks
- Staple gun and assorted staples
- Masking tape
- Portable vise
- Electric power tools, saber saw, electric drill (1/4" or 3/8" capacity), Dremel jig saw, and finishing sander
- Abrasive paper, various grits

*Some tools can be used on other materials in addition to wood. For example, high speed drill bits will produce holes in metal and plastics.

METALWORKING TOOLS AND MATERIALS

Tinsnips
Scratch awl
Center punch
Solder gun
Soldering iron
Solder, 50/50
Metal files, assorted
Ballpeen hammer
Tap and die set
Hacksaw
Cold chisel, 1/2" wide
Screw drivers, assorted
Adjustable wrench
Slip-joint pliers
Carriage clamps
Machine screws, assorted
Sheetmetal screws, assorted
Duct tape

SCREEN PRINTING TOOLS AND MATERIALS

Screen printing frame
Squeegee
X-acto knife
Wood mallet
Scissors
Saddle stapler
Standard staples
Screen printing ink
Cotton organdy
Paper tape, 2" wide
Blockout
Screen frame cord
Lacquer thinner
Acetone

LEATHERWORKING TOOLS AND MATERIALS

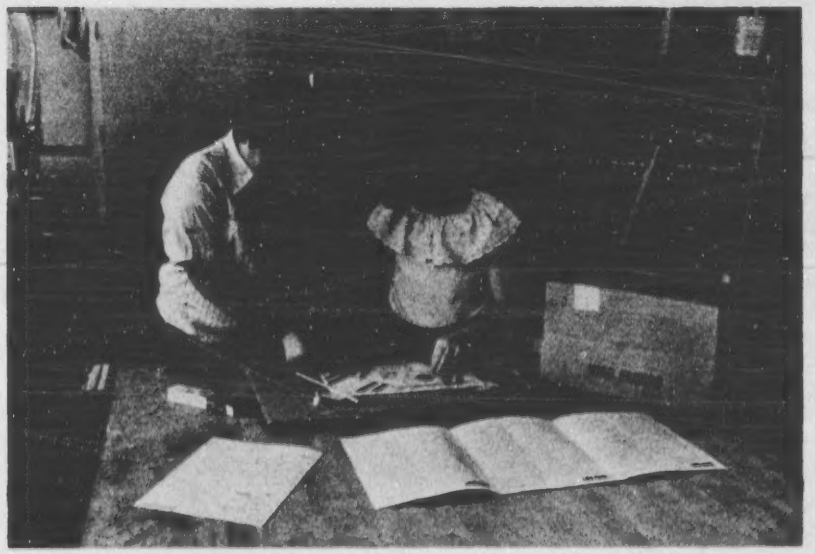
Thonging chisel, single
4 prong
Rotary punch
Hollow punch, 7/32" dia.
Wood mallet
Tapestry needle
Bandage scissors
Saddle stitching thread
Rivets, assorted
Snap set and snaps

POWER TECHNOLOGY TOOLS AND MATERIALS

Dry cells, D size
Copper wire, stranded, 20 ga.
Magnet wire, 18 ga., 20 ga., and 24 ga.
Bell wire
Telephone wire
Magnets, assorted
Alligator clips
Battery holders
Ohm meter
Rosin core solder
Wire stripper
Soldering gun

The Use of Kits

In some situations, the use of kits can ease the teacher's task of preliminary preparation of materials. In these kits, most of the major processes have been completed so that students need only use basic hand tools to finish their projects. Kits can be purchased commercially, or they can be produced by the classroom teacher, the industrial arts consultant or cooperating high school students.

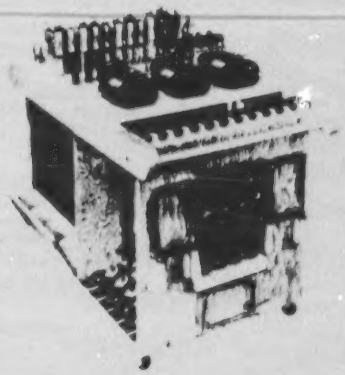


Although the use of kits exposes children to fundamental industrial processes while significantly reducing the amount of time required to complete the activity, a major drawback is the reduction of opportunities for creative expression. Also, students are not exposed to the idea of implementing scrap material as a useful item, since all components are provided in kits. Furthermore, if commercially produced kits are used exclusively, this method could be costly over a period of time.

Storing the Equipment

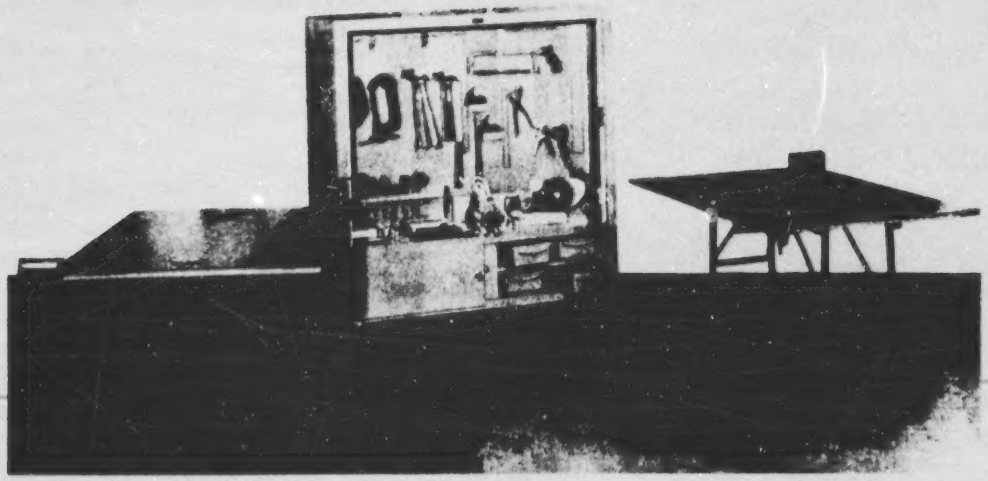
Storage of safety glasses, tools, materials, and equipment should be at a place easily accessible to students. In some programs, this has been accomplished through the use of a portable tool cart or stationary tool panels. In considering an appropriate storage unit, each school district should study its own needs based on conditions such as the number of teachers to be served, and the physical location of one classroom to another.

While storage units can be made by an industrial arts consultant, commercially-produced storage units are also available. Two examples of commercially-produced storage units are shown on this page and the following page.[2]



Stanley Mobile Tool Cart 37-148

[2]For information about the Stanley Tool Cart, contact Stanley Tools, Division of Stanley Works, New Britian, Connecticut 06050. Information about the "Tote-L-Shop" is available from Brodhead-Garrett Company, 4560 E. 71st Street, Cleveland, OH 44105.



Brodhead-Garrett PTC-200-T "Tote-L-Shop"

Safety Considerations

Making ESIA a Safe Experience

Safety Considerations: Making ESIA a Safe Experience

Although industrial arts activities present safety hazards, they also present opportunities for students to learn safety instructions. The benefit of safety instructions, of course, is the prevention of a physical disability. Another benefit, however, is the development of a child's positive attitudes toward safe practices in all activities, in and out of school and throughout life.[1]

Safety instructions for making a pocket flashlight include proper handling of sharp pointed tools, handsaws and hand drills, and the use of safety glasses.

[1]Safety considerations discussed in this unit merely offer a guide. For a comprehensive reference, see The Pennsylvania Industrial Arts Safety Guide (Pennsylvania Department of Education and the Industrial Arts Association of Pennsylvania, 1978). Some topics are: the responsibilities of teachers, administrators, parents and others, what to do in an emergency, accident reports, handicapped students, instructional techniques, safety rules for large and small power equipment, facility planning, and teacher liability. Also, see Monograph 10 of the American Council for Elementary School Industrial Arts, AIAA, 1914 Association Drive, Reston, VA 22091, which is available at a minimal cost.

Basic Considerations

Safety instruction must not only be a part of all industrial arts activities, but also a primary consideration during lesson planning.

SPECIFIC CONSIDERATIONS

1. Incorporate safety instructions which will apply to each lesson and document them in lesson plans.[2]

2. Eye protection such as plastic monogoggles or industrial-rated safety glasses must be provided for all students engaged in or exposed to an eye hazard.[3]

[2] See the sample lesson plan in this guide for an example of how to document safety instruction.

[3] Act 116 (HB 159) provides for the use of eye protective devices by persons in schools, colleges and universities. See page 158 of this guide.

3. Make students aware of potential hazards and of necessary precautions to be taken. Provide instruction on the safe use of tools and materials and on potential hazards prior to the actual laboratory activity.

4. Set a proper and safe example for students at all times. This is often referred to as being safety conscious.

5. Demonstrate the proper use of cutting tools, such as saws, knives, scissors and chisels and how to carry sharp tools safely.

6. Protective clothing such as gloves, aprons and face shields, should be provided in areas where needed (see Act 116).

7. Tools, benches and other equipment must be of proper physical size for the students using them. Benches and tools designed for teenage students could create a safety hazard for younger students.

8. Good housekeeping procedures are imperative for safe working conditions. Implement and enforce these procedures by demanding that work areas be kept neat and orderly.

9. The classroom must be supervised by a competent adult at all times.

10. Be aware of students who have physical or mental handicaps which might endanger their own safety or the safety of others. A brief consultation with the school nurse or doctor could be very helpful if a student's behavior or records indicate a handicapping condition.

11. All facilities in the classroom should be kept in good repair to insure the safety of students. Remove dull or broken tools until they have been sharpened, repaired or replaced.

12. Keep parents informed about the use of industrial arts activities and the safety procedures practiced.

8. Good housekeeping procedures are imperative for safe working conditions. Implement and enforce these procedures by demanding that work areas be kept neat and orderly.

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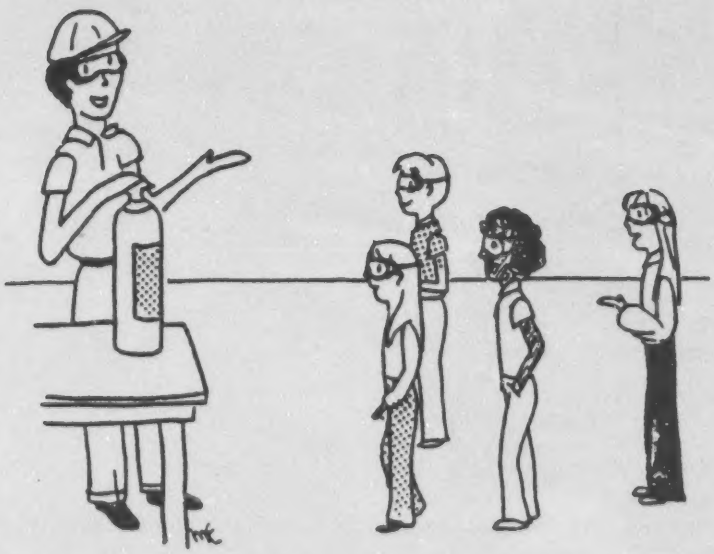
12. Keep parents informed about the use of industrial arts activities and the safety procedures practiced.

13. Be especially careful in the use of flammable and hazardous materials. Storage of these materials must be in an approved metal cupboard or locker. When using these materials, ventilation is also paramount. In addition, waste disposal of flammable materials must be in accordance with environmental standards. Some examples of hazardous and flammable materials are aerosol spray cans, lacquer thinner, paint thinner,

shellac, polyester resins (clear casting material), alcohol, oil stain, varnish, blockout for screen printing, and oil-based inks for printing. All these materials burn rapidly and accelerate combustion!

14. Both students and teachers should know the location and use of a fire extinguisher. If necessary, have a member of the local fire department demonstrate this process to the class.



15. Place all oily and dirty rags in an approved metal container.

16. Instruct students on the safe use of electrical current.

17. Consider potential safety hazards when planning or selecting industrial arts activities. Sharp pencils, compasses and other pointed objects can cause serious injuries when they are in the hands of untrained persons. When using a paper cutter, be sure it is used only under the supervision of a competent adult.

18. Plan and establish a procedure for use in case of an emergency. All students should be familiar with this procedure while being involved in its planning and implementation.

19. An accident report should be completed by the student and the instructor immediately after any accident, regardless of how minor. A copy of this form should be filed for reference.

20. A key lock switch should be placed on each power equipment. Locking devices will eliminate unauthorized use.

INSTRUCTIONAL TECHNIQUES

1. Impart positive attitudes toward safe practices by stressing the correct way of doing things.

2. Involve the students in your safety program in an active and positive manner. One example would be to give each student the opportunity to act as a safety engineer as part of the daily activity schedule and clean-up procedure. This type of responsibility can make them aware of their own well-being and the safety of their classmates.

3. Assist students in recognizing unsafe conditions and situations when something is being done incorrectly.

4. Appoint or elect a student safety committee to help establish a strong safety program in the classroom or in the industrial arts laboratory.

5. Secure persons from the community to discuss safety procedures in their own occupations. Several examples might include a police officer, firefighter, or a personnel director from an industrial plant.

6. Have students prepare bulletin boards or posters displaying safety rules and regulations.

7. Assign individuals or groups a topic on some phase of industrial safety to be researched in the school library. Students can describe their findings in written form and duplicate sufficient copies for classmates, or give an oral report.

8. Conduct safety inspections of the classroom or the industrial arts laboratory. If appropriate, the teacher should initiate actions based upon their recommendations for improvement.

9. Design a bulletin board to indicate the number of "accident-free days" while participating in industrial arts activities. If a pre-determined goal is reached, award a special prize or award to a group or individual members.

Sample Accident Report (to be completed by the instructor and the student)

Student's name _____ Grade _____

Location of accident _____

Date of accident _____ Time _____

Description of the injury _____

_____

_____

Location of instructor when accident occurred _____

Description of how the accident happenend _____

_____

_____

_____

_____

Indicate equipment or tools involved (if any) _____

A description of the unsafe practices contributing to the accident (if any)

_____

_____

_____

_____

_____

_____

Suggestions for prevention of similar accidents _____

_____

_____

_____

_____

Witnesses to the accident (1) _____

(2) _____

Instructor's signature _____

Date _____

Student's signature _____

Date _____

_____

Act 116: Pennsylvania Statute, Eye Protective Devices

The General Assembly of the Commonwealth of Pennsylvania hereby enacts as follows:

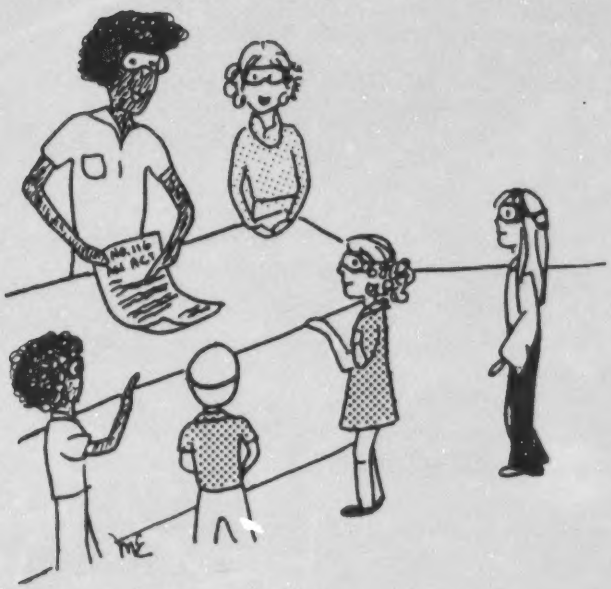
Section 1: Every teacher, student, visitor, spectator, and every other person in any shop or laboratory in public or private schools, colleges and universities who is engaged in or is within the area of known danger created by: (1) the use of hot liquids, solids or gases, or caustic or explosive materials, (2) the milling, sawing, turning, shaping, cutting, grinding or stamping of solid materials, (3) the tempering, heat treatment or kiln firing of metals and other materials, (4) gas or electric welding, or (5) the repairing or servicing of vehicles, shall wear industrial quality eye protective devices at all times while engaged in such activities or exposed to such known dangers.

Section 2: Schools, colleges and universities shall have the power to receive federal, state and local monies and to expend the same to provide such devices and shall furnish such devices to all visitors and spectators and all other persons required under the provisions of this act to wear them.

Section 3: Enforcement of this act shall be in accordance with standards, rules and regulations promulgated by the State Board of Education.

Section 4: For the purposes of this act, "industrial quality eye protective devices" mean devices meeting the standards of the American Standard Safety Code for Head, Eye and Respiratory Protection, Z2. 1-1959, promulgated by the American Standards Association, Incorporated.

Section 5: This act shall take effect immediately.



Resources

What Kind of Local Assistance is Available?

Resources: What Kind of Local Assistance is Available?

Human and material resources are available, but it takes ingenuity to find them. When students, teachers, administrators, parents, friends and relatives know about a teacher's needs because of an intended or existing industrial arts program, they begin to think about resources they have or others may have that could be shared. Also, when a teacher's search for resources becomes a concern shared by others, relationships are often established that prove to be invaluable in locating additional material and human resources.

Some human resources might include:

- Local industrial arts instructors, supervisors and consultants.
- High school students (enrolled in industrial arts classes or participating in an industrial arts club) who can suggest project ideas, assist in preparing materials, and provide supervision during an ESIA activity.
- Elementary school students who can provide suggestions based upon their interests and needs.
- Identification of human resources through a class discussion of parents' occupations.

- Community service organizations (e.g., Jaycees, Lions, Rotary, Kiwanis and the Chamber of Commerce) which can be excellent sources for providing speakers, services and materials.
- Parents and educational aides.
- Local home and school associations (PTA, PTO, etc.) which may wish to become actively involved once the program goals are clarified and understood.
- Other teachers in the school district who can give suggestions, or actually become involved in the activities.
- Senior citizens who may wish to participate in some way.
- Field trips to local industries which is another possibility for involving people in the community.
- The purchasing agent for the local school district who can make suggestions when attempting to identify sources for materials (free or purchased).

Material resources can be purchased with local school funds through the normal bidding process. If there are industries in the community, however, most likely there are free scrap materials, too. The classroom teacher or the industrial arts consultant can contact their local industries, suppliers and manufacturers to ask about the availability of scrap materials. Because industry rarely approaches a school district, the teacher should initiate this contact. Some industries, when contacted, will provide more assistance or materials than what is needed! If this is the case, teachers should take whatever materials are offered and share them with their colleagues.

Other sources of obtaining free materials are the industrial arts and vocational education classes conducted at high schools or area vo-tech school where small pieces of paper, metal and soft wood are usually discarded as scrap. If approached in a proper manner, vocational and industrial arts teachers may offer scrap materials or other materials at little or no additional cost to the local school district. This is one example of how "building bridges of support and understanding" can enhance an ESIA program.

The following list indicates free material resources provided to a suburban school district for use in its ESIA program:

Material	Connection	Donor
Scrap wood (oak, pine, poplar, plywood, 1/8" thick cardboard or binders board)	Friend and a local manufacturing company	Home builders company
Scrap paper and printing ink	Former student	Local printing company
Paper, book binding materials and adhesives	Brother	Publishing company
Wood glue	Friend	Adhesive company
Acrylic plastic	Friend	Hospital incubator manufacturing company
Acrylic plastic	Student's father	Sign company
Polyester resin	School board member	Fiberglass manufacturing company
One-inch dowel rods	Friend	Window shade company

(listing continued)

Material	Connection	Donor
Polyester resin	Uncle of former student	Button manufacturing company
Assorted wire	Public relations department	Telephone company

When a group or business donates material or human resources, a letter or thank-you note from a teacher is good etiquette. Photographs or sample projects can also express the students' appreciation for their assistance. Acts of courtesy and appreciation will continue to keep lines of communication open for future needs.

Public Relations

Gaining Support for an ESIA Program

Public Relations: Gaining Local Support for an ESIA Program

Any program, especially a new one, will not survive very long without the support of the public it serves. Too often, educators forget this most important aspect of their responsibilities until programs fail because of a lack of public support and, therefore, lack of local financial support. When the public understands how ESIA activities can enhance all aspects of elementary education, valuable support is gained.

Evidence of the need for and value of an effective public relations program to gain positive feelings within the community is shown in two studies conducted during the 1960s. The studies involved interviews with community leaders in 82 school districts and a representative sample of voters from four cities.[1] These studies found, among other things:

- The voter thinks schools are good in general, but criticizes "frills" and "too much play" in certain areas.
- The voter thinks the teaching of fundamentals--reading, writing, spelling, and arithmetic--are the most important tasks, and that the least important tasks are the teaching of arts, music and industrial arts.
- About half the voters show no evidence of any participation in school affairs and no interest in such participation.

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[1]The studies are summarized by Richard F. Carter and William R. Odell, The Structure and Process of School-Community Relations: A Summary (Stanford Institute for Communication Research, 1966).

With these thoughts in mind, the commitment of administrators to conduct an on-going public relations program can prove invaluable. The nineteenth century attitude that "papa knows best", which is sometimes reflected in schools today, will often be interpreted by the community as an administration that is arbitrary and inflexible. Effective two-way communication, therefore, between a school and the community it serves is an essential part of a public relations program.

An effort to gain positive feelings within the community for an ESIA program must be based upon honesty and facts, not half-truths and suppositions of some individuals. Educators cannot wait for rumors or problems to cause negative feelings within the community. To avoid this pitfall, it is essential to conduct an on-going public relations program.

The first recommendation in gaining support for an industrial arts program at the elementary level is to show parents and personnel of the local school system the advantages of an ESIA program for their children. Ways to gain this support can be through publications[2] and other correspondence, and an "ESIA awareness workshop." Additionally, administration, staff, and parents should be periodically informed about the program and how it is affecting their children's education.

[2]A brochure which introduces parents to an ESIA program and its advantages for their children will be available September 1983 from the Pennsylvania Department of Education, Publications, 333 Market Street, P.O. Box 911, Harrisburg, PA 17108.

Open House or Visitors Day can be an excellent time to gain public support for an ESIA program. Students can be actively working when parents arrive at the classroom, and perhaps assist with the completion of the industrial arts project.

One method for keeping parents informed about the ESIA program, is through students themselves. If the program is valid and effective, students will most likely share their successes with their parents. Another method of extending this influence is to invite parents to view, and if possible, participate in their childrens' experiences. This participation could take place at either the home or school setting, depending upon local conditions.

Sample Lesson Plan

Sample Lesson Plan

The lesson plan included in this guide is an example of an ESIA activity. The writing committee of this guide also compiled a handbook which includes 17 lesson plans, an annotated list of over 50 resources to assist in developing additional lesson plans, and an annotated list of audiovisual resources that can be borrowed from the Pennsylvania Department of Education. To obtain this handbook, ESIA Lesson Plans and Resources for Elementary Classroom Teachers and Industrial Arts Consultants, write to John Lucy, Professor and Project Director, Industrial Arts and Technology Department, California State College, California, PA 15419 (412-938-4086).

I. NAME OF ACTIVITY: PAPER MAKING

II. PURPOSE OF ACTIVITY

Through this hands-on activity, intermediate-level students will be able to understand the various steps in the manufacturing of paper. Furthermore, this papermaking activity can introduce or supplement writing, research and discussion activities involving paper products of past and present societies.

III. BEHAVIORAL OBJECTIVES

At the completion of this lesson, each intermediate-level student will successfully:

1. Relate the production of paper to the environment, occupations and industry.
2. Discuss the historical record concerning writing paper and its use in communications.
3. State the raw materials necessary for producing paper.
4. Produce one sheet of paper as demonstrated by the teacher.
5. Use the produced paper within a writing activity.

IV. APPLICATION AND ACQUISITION OF SKILLS

Gross Motor Training
- Lifting
- Shaking
- Walking

Fine Motor Training
- Eye exercises
- Squeezing sponges
- Writing
- Folding
- Cutting
- Drawing

Language Activities
- Deciding
- Discussing
- Explaining
- Giving directions
- Listening
- Naming objects
- Noting relationships
- Reacting
- Reporting
- Sharing information

Science Activities
- Comparing
- Discovering
- Experimenting
- Observing
- Questioning
- Reporting

Social Studies Education	Industrial Arts Activities
Appreciating workers	Appreciating the world of work
Developing positive attitudes toward people and things	Discovering materials
Improving personal work habits	Improving gross and fine motor skills
Exploring simple economics	Manipulating tools
Understanding role of self	Respecting tools and materials
Valuing self	Understanding interdependence of people and machines

V. TOOLS AND EQUIPMENT

Electric blender
Nylon stocking
Electric iron
Plastic dish pan
Deckle and mold, must fit into the above dish pan (see drawing for details)
Sponge, flat-type, must fit inside deckle and mold

VI. MATERIALS

Paper egg cartons
Rags, clean, 12" x 14"
or
Felt, white, 12" x 14"
Newspapers, old, many
Bleach, laundry, one gallon (optional)
Water

VII. SAFETY CONSIDERATIONS

1. The teacher should operate the electric blender when chopping up the small pieces of egg carton.
2. The students should be made aware of the need for care in moving from one station to the next. This activity can become quite sloppy due to the use of water. Water on the floor and table can be dangerous in several ways. First of all, one might slip and fall when walking. Secondly, a student could be electrically shocked when drying pieces of paper with an electric iron.
3. Goggles should be worn by both the teacher and students when laundry bleach is used in making the paper white in color (making the paper white is optional).

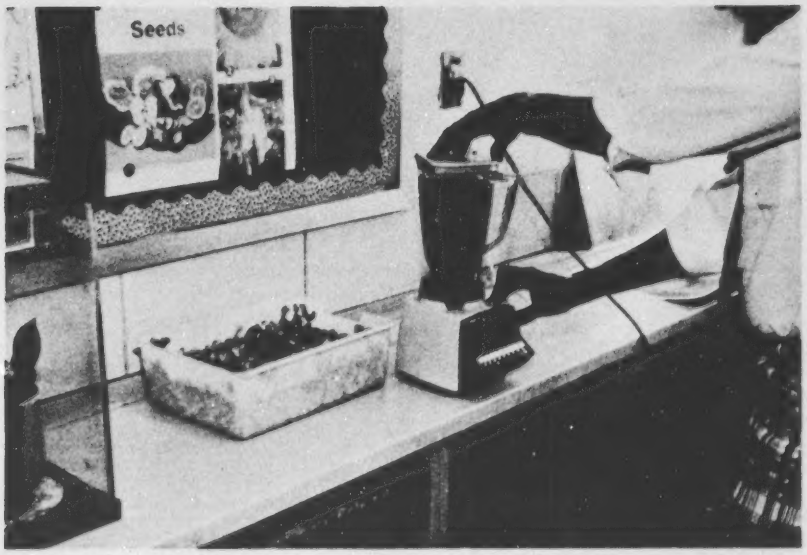
VIII. CAREER AWARENESS

A paper making activity is rich with opportunity to explore and develop interests and information concerning various careers. Specifically, students may wish to discuss careers related to harvesting timber, producing paper or selling paper products. The students could role play these careers. Students could identify paper products in their classroom and discuss the type of jobs that are related to these paper products.

IX. PROCEDURE

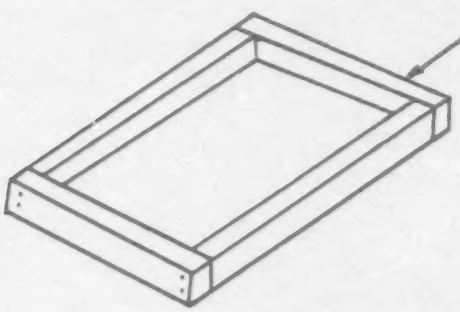
1. Distribute parts of the paper egg cartons to the students in the class. Ask them to tear the egg cartons into very small pieces.
2. Preferably, these small pieces should be soaked in water over night.

3. The teacher should place 1/2 cup of wet egg carton pieces into an electric blender which is 3/4 full of water. Blend on high speed until all pieces are broken apart.

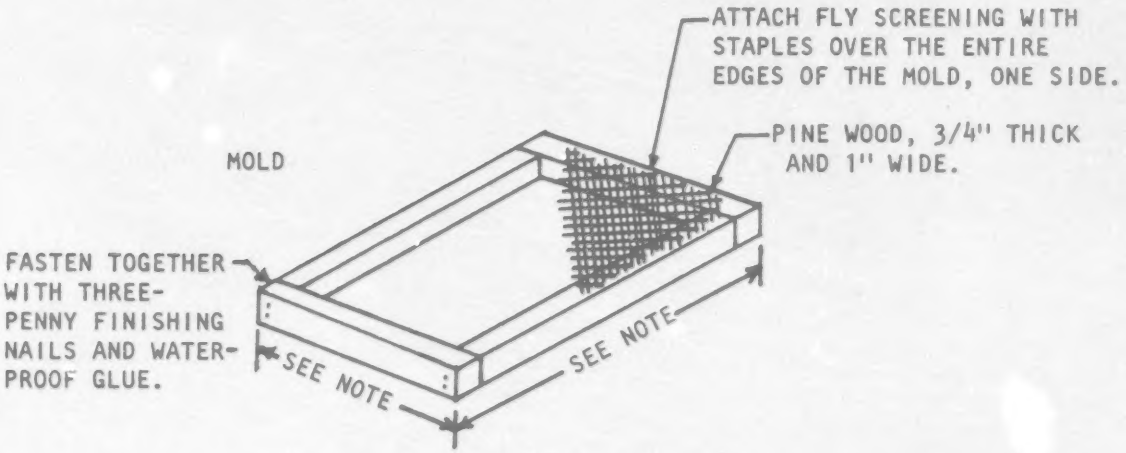


4. Pour this mixture into a nylon stocking. The water will flow through the stocking and the wood fibers will remain.
5. Place at least two cups of the fibers into a large plastic dish pan which is 2/3 full of water. The fibers can be evenly spread by agitating the water.

6. Secure at least one deckle and mold set using these shapes and sizes.



DIMENSIONS ARE THE SAME AS FOR THE MOLD, EXCEPT NO FLY SCREENING IS APPLIED.


ATTACH FLY SCREENING WITH STAPLES OVER THE ENTIRE EDGES OF THE MOLD, ONE SIDE.
PINE WOOD, 3/4" THICK AND 1" WIDE.
MOLD
FASTEN TOGETHER WITH THREE-PENNY FINISHING NAILS AND WATER-PROOF GLUE.
SEE NOTE
SEE NOTE

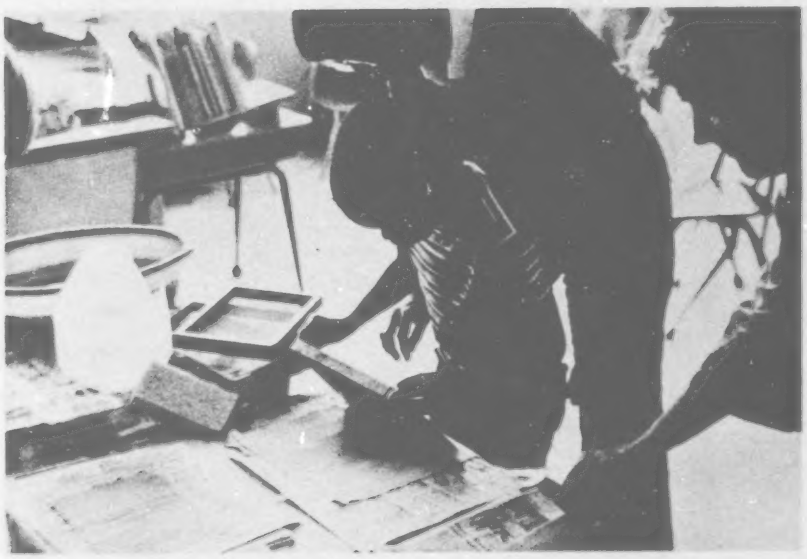
NOTE: THE OVERALL SIZES OF THE DECKLE AND MOLD WILL DEPEND ON THE INSIDE DIMENSIONS OF THE DISH PAN. IN MOST INSTANCES, THE OVERALL SIZES OF THE DECKLE AND MOLD WILL BE APPROXIMATELY 7½" WIDE AND 10½" LONG.

DRAWING OF DECKLE AND MOLD

7. At Station Number One, place the deckle on the screen side of the mold.
8. Slide both the deckle and mold into the dish pan as illustrated below.

9. Hold the parts together on the bottom of the dish pan until the fibers are evenly distributed on the top of the water. Slowly bring the deckle and mold up through the fibers and out of the water.
10. Allow most of the excess water to drip back into the dish pan. Be sure not to hurry this step. Excess water on the floor is dangerous.

11. Go to Station Number Two while holding the deckle and mold with the wet fibers together.
12. At Station Number Two, remove the deckle and slowly turn the mold (with the fibers on it) over onto the top of a clean rag or white felt approximately 12" x 14". This is demonstrated in the following manner.



13. Using a flat sponge that will fit inside of the mold, press on the water. Wring out the sponge as it becomes soaked with the water. Repeat this step several times in this way.

14. Slowly lift one corner of the mold while having the sheet of fibers remaining on the clean rag or felt sheet.
15. Move the cloth with the fibers on it to Station Number Three. The deckle and mold can be returned to Station Number One for use once again by the next student.

16. Place a dry piece of cloth on top of the wet sheet of fibers. Place several old newspapers under this "sandwich" of cloth and wet fibers. These newspapers will help soak up the water but will have to be changed occasionally.
17. Place a hot electric iron on top of the clean cloth and wood fibers. Iron this "sandwich" in order to dry the wood fibers.

18. After several minutes of ironing, turn the "sandwich" over to dry the back side. Repeat until the fibers are completely dry.
19. Remove the sheet of "paper". Be sure to observe the deckle edge that is present on all handmade paper.

X. FINAL SUGGESTIONS

If students want to make paper that is white in color, then the teacher should soak the fibers in a strong solution of laundry bleach. This can be done after chopping the fibers up in the electric blender but prior to placing them in the plastic dish pan. The bleached fibers can be strained off with the nylon stocking while keeping the bleach solution for the next batch. Be sure to wear goggles when using a bleach solution. The amount of time the fibers are in the bleach solution to obtain the white color is determined by visual inspection.

The class should make some use of their sheet of paper. This could include activities such as making a cover for a booklet in social science, or writing a report. Various designs could also be screen printed on it in art class to be used as a greeting card. This experience could also be correlated with a science lesson on the use and development of wood and paper products in our everyday lives.

ESIA Evaluation

How Well Did We Do?

ESIA Evaluation: How Well Did We Do?

As students participate in industrial arts activities, teachers and parents will notice changes in students' attitudes, knowledge and skills. Evaluation techniques make it possible to measure and document those changes. When evaluating, two results often occur: planned outcomes which relate to the objectives of the learning experience or lesson, and unplanned outcomes which were not anticipated when objectives were planned prior to the activity.

Unplanned outcomes are often as significant as planned outcomes. For example, students who are constructing a project may ask what kind of wood is being used. Sometimes a one-word answer, such as "pine," will suffice. Sometimes, however, the teacher may ask students to show a piece of wood to an industrial arts teacher for identification. In some situations, a visit to a lumber yard would be appropriate. Students could learn not only the kind of wood it is, but what part of the country it was harvested, and how it was transported (truck, train, etc.) to the lumber yard. These additional learning experiences could also inspire students to find out what kinds of wood, if any, are cut locally, how they are used, and so forth.

In another situation, for example, students who are painting their projects may wonder how paint is manufactured. An investigation, such as the one described above, could be done. A telephone interview with a local paint store owner, or a letter to a paint manufacturer could also provide more information. Painting is another experience that could elicit planned and unplanned outcomes. Students could investigate how skills in painting are used throughout life by polling their parents to determine how often they paint things at home, what kinds of equipment are used (brushes, rollers, spray cans) and which specific finishes are used (enamel, latex, stains).

The value of these learning experiences is not only the accomplishment of objectives (planned outcomes), but perhaps more importantly, the development of skills and curiosity which can enhance students' self-discovery and awareness of the world around them (unplanned outcomes).

Evaluation Techniques

Knowledge gained through ESIA activities may be evaluated using techniques already familiar to students and teachers. Several examples would include student reports, vocabulary lists, quizzes or tests (written or oral) and games requiring the application of new knowledge, to mention only a few.

Measuring a child's acquisition of tool skills and safety attitudes and practices, and her or his development of problem-solving abilities, and social skills such as cooperation, sharing and assisting, are also helpful in the evaluation process. Growth in these and similar areas is best measured while the activities are being performed with the use of check lists, sociograms, annecdotal notes or other information gathering procedures. These may form the basis for class or individual discussion which build upon the good things which are happening and which call attention to areas needing improvement. Such observations and discussions also provide valuable bases for planning future activities.

The key ingredients in any of the observation techniques are providing time to observe, and a simple system for quickly recording pertinent data. Audio and video recordings are possibilities, but, they usually have limited focus and take as long to review as the length of the activity itself. Another method is to have students record pertinent data for specific and routine activities, such as assuring that safety goggles or glasses are being worn when needed. The best approach, however, usually involves direct observation and note taking by the classroom teacher. To do this effectively, the teacher may have to "step outside" the activity. One way is to appeal to students' imagination and ask for their respect of simple rules. A bright colored shawl can become the teacher's "cloak of invisibility." When the teacher puts the shawl on for short time periods, students must assume their instructor is invisible. While the shawl is worn, no one may talk to the teacher, except in an emergency, and neither can the teacher talk to the students. After some initial confusion or playfulness, students will accept the game and the classroom teacher will be able to observe and take notes.

Regardless of the techniques used to collect and evaluate information, evaluation is valuable only to the degree that it helps students learn better, helps teachers instruct more effectively, and helps administrators and parents to understand more completely, and to support more fully, the industrial arts activities. The next few pages suggest evaluation techniques that involve students, teachers, administrators and parents.

Many concepts and skills can be learned through an activity that combines language arts, natural science and industrial arts. This student constructed a small planter with flowers grown from seed, and wrote and produced a booklet.

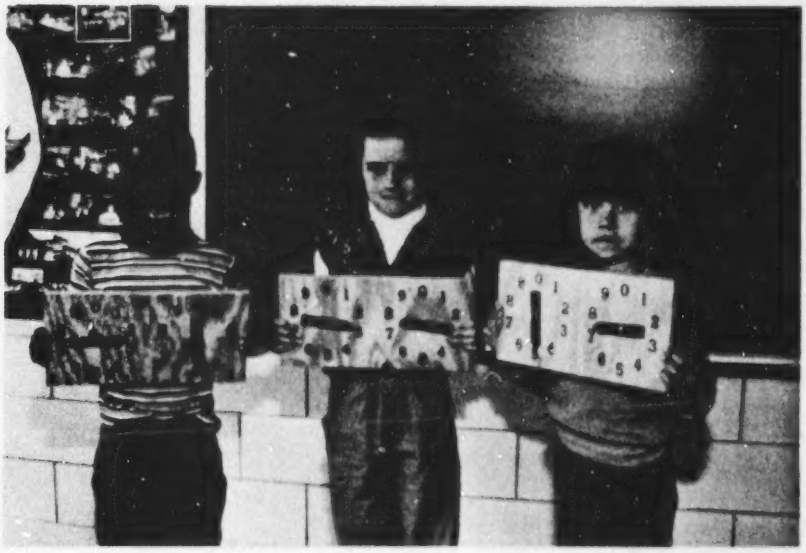
Students may examine:

- What do I know now that I didn't know before this activity?
- What previous knowledge was I able to use in this experience?
- What can I do now that I couldn't do or had never tried before?
- Which previously-acquired skills were used and strengthened by this experience?
- Which parts of the activity did I like best? least?
- What have I learned about myself and/or other people through this activity?

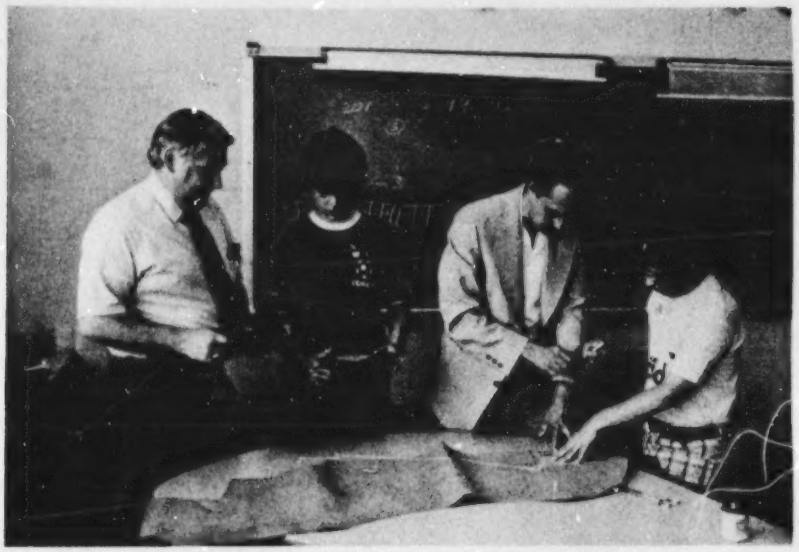
Classroom teachers and industrial arts consultants, in addition to evaluating students' answers to the above questions, may examine:

- The extent of achievement of the planned objectives.
- The value of unplanned outcomes.
- Ways to overcome any problems encountered.
- Methods that would make the activity more successful next time.
- The extent to which planning, preparation and time involved were justified by the results of the experiences.
- Resource persons and sources of materials which might contribute to future activities of this type.

These three kindergarten pupils produced small wooden sailboats within the allotted time period, and met the teacher's predetermined criteria for success.



These third-grade students were also successful when they completed their "Spinner Boards" which are used for reinforcing multiplication skills in math class.



Teachers evaluate the students' progress in much the same way their students learn about the world about them; through their senses. In general, this requires teachers to ask questions, listen to students' answers and observe work patterns and finished projects.

Administrators might consider:

- Sharing with the teacher and students feedback they receive concerning the activities from other teachers, librarian, custodian, school personnel, parents and persons in the community.
- Ways to encourage teachers in providing the most meaningful experiences for children.
- How they can assist teachers in utilizing the best resources available.

Parents might want to:

- Share with the classroom teacher or the industrial arts consultant their observations of the effects the activities have had on their children.
- Know how they can support or expand the experiences at home.

Since many industrial arts activities involve making or doing something, some part of the evaluation may focus on what was made or done. Teachers and students may want to discuss:

- What part of the process did we learn to do well?
- What part of the project looks better or works better than other parts?
- Which parts of this activity could be done better, if repeated? How could it done better?
- If this object or process were performed in industry, how could it be improved? This could include discussions such as the training of workers, the development of more accurate or powerful tools, and the use of better materials.

Additional Copies of

Elementary School Industrial Arts:
An Educator's Handbook Containing Approaches
and Resources for Making the Elementary Education
Curriculum More Effective Through Industrial Arts Activities

and

ESIA Lesson Plans and Resources
for Elementary Classroom Teachers and Industrial Arts Consultants

can be obtained from:

Publications Unit
Pennsylvania Department of Education
333 Market Street
P.O. Box 911
Harrisburg, Pennsylvania 17108

or

Dr. John H. Lucy
Professor and Project Director
Industrial Arts and Technology Department
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California, PA 15419
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